Zool.
321 ugd

4° Zool.
321 uzd

Lars

Contributions

to the knowledge of the

Fresh-water Entomostraca of New Zealand

as shown by artificial hatching from dried mud

By

G. O. Sars

With 8 autographic Plates, partly coloured from living specimens

(Read 16 Nov. 1894)

Videnskabs-Selskabets Skrifter. I. Mathem.-naturv. Klasse. 1894. No. 5

In Commission by Jacob Dybwad

A. W. Bröggers Printing Office

1894

BIBLIOTHECA
REGIA
MONACENSIS

Introductory.

The fresh-water Entomostraca of New Zealand have been studied by Mr. Geo. Thomson at Dunedin, who, in a paper on New Zealand Crustacea, read before the Otago Institute in 1878, records 4 species of *Ostracoda*, 1 *Copepod*, 2 *Cladocera*, and 2 *Phyllopoda*. In a subsequent paper, he describes an additional species of *Daphnia*, and in another paper a fresh-water *Calanoid*, which formed the type of a new genus. The total number of New Zealand Entomostraca, as yet known, thus amounts to only 11 species, and as, moreover, one of the species of Ostracoda (*Cypris novæ zealandiæ* Baird) is believed to be most probably identical with the species described by him as *Cypris ciliata*, the real number is properly only 10 in all.

This seemed indeed to point to a perplexing scantiness of the fresh-water fauna of that isolated country, as compared with the neighbouring continent of Australia, where a rather large number of species have long ago been recorded by the Rev. R. L. King. To judge from the inconsiderable distance between the two countries, it would be anticipated, that some concordance might exist in the character of their faunas. But we find that in fact none of the species recorded by Mr. Thomson are identified with Australian species.

Having some years ago instituted with very good success a series of experiments in raising Entomostraca from dried Australian mud, I was anxious to procure some material also from New Zealand, in order to get an idea of the character of the fresh-water fauna of that remote country, and to this end I asked Mr. Thomson to send me some mud to be experimented with. He readily complied with my request, sending me at first 2 samples of dried mud collected in the neighbourhood of Dunedin, and some time afterwards another parcel of mud from the North-Island.

The first two parcels were received on the 18th June, 1890, and I immediately commenced my experiments, which have partly been continued also during the following years. The results of these experiments I now propose to publish, giving descriptions and figures of the several species, which were raised in my aquaria. The number of these species amounts to 17 in all. Of these, 5 are found to be identical with species already described by Mr. Thomson from the localities in which the mud was collected, 5 others have been identified with species described by the Rev. R. L. King from the neighbourhood of Sydney, and the remaining 7 species are apparently new to science. Five of the species belong to the *Cladocera*, 11 to the *Ostracoda*, and 1 to the *Copepoda*. Most of the species have been watched in numerous succeeding generations, and some of them have also reappeared during succeeding years, after the bottom residue of the aquaria had been kept in a dried state during the winter.

The accompanying plates have been prepared by the autographic method, and subsequently printed in colour after the original drawings made by the author from living specimens.

Description of the Species, with biological Observations.

Order: **Branchiopoda.**

Suborder: **Cladocera.**

Tribe: **Calyptomera.**

Subtribe: **Anomopoda.**

Fam.: *Daphnidæ.*

Gen.: ***Daphnia,*** Müller.

1. *Daphnia Thomsoni,* G. O. Sars.

(Pl. I).

Daphnia similis, Thomson, On a new species of Daphnia. Trans. N. Zeal. Institute, Vol. XVI, p. 240, Pl. XIII, figs. 6—9.

Specific Characters. Carapace in female seen laterally broadly oval, in male oblong, spine not very much elongated, straight, and somewhat upturned. Head in female of moderate size, carinated throughout, and dorsally only defined from the carapace by a shallow sinus, seen laterally nearly semicircular in form, rostrum produced to a very acute, somewhat deflexed point; that in male somewhat depressed, with the frontal part obtusely produced, and the rostrum obsolete. Fornix moderately prominent, and terminating on each side in an angular corner. Eye well developed and rather large in the male, with distinctly projecting crystalline bodies; ocellus very small. Antennulæ in female extremely minute, and scarcely projecting beyond the edges of the head; those in male about the length of the head, and terminating with a distinct setiform flagellum. Tail in female with the terminal part gradually narrowed distally, anal denticles 12—14 on each side, terminal claws rather strong and curved, being finely ciliated on the concave edge; that in male without any dorsal process, terminal part considerably

tapering distally and somewhat curved, anal denticles 7 on each side, placed close together at some distance from the tip, terminal claws comparatively small. Ephippium with obliquely disposed ampullæ. Body in both sexes highly pellucid, with a more or less distinct reddish tinge. Length of adult female (excluding the spine) 3.70 mm., of male 2.05 mm.

Remarks. This form was briefly described and figured by Mr. Thomson in the above quoted paper as *D. similis*; but as this name has already been given by Prof. Claus to another, apparently distinct species found in a pond near Jerusalem, the specific name of the New Zealand species must be altered. I propose to name it after its discoverer.

The species is very nearly allied to *D. carinata* King, of which I have had specimens for examination, differing somewhat, however, in the form of the rostrum and in the structure of the tail. The carina of the head is moreover far from being so strongly developed as in that species, and the spine of the carapace is also less elongated, sometimes even very short.

Description of the female.

The largest specimens examined attain a length (excluding the spine of the carapace) of 3.70 mm. and this form accordingly grows to a rather large size, as compared with most other species of the genus.

The body is, as usual, rather compressed (see figs. 1 & 2), the greatest width scarcely exceeding half the height and occurring about in the middle.

The carapace exhibits, in a lateral view of the animal (fig. 2), a rather regular, broadly oval form, though being somewhat narrowed in its posterior part. The dorsal face is distinctly carinated and more or less curved, according to the degree of distention of the matrix with ova or young. The ventral edges are rather evenly curved throughout, joining the anterior edges by a somewhat stronger curvature. The spine of the carapace issues somewhat above the longitudinal axis, and is quite straight and slightly upturned. Its length is somewhat variable, being, as a rule, longest in the specimens of the earlier generations, and in these nearly attaining half the length of the carapace. In later generations it generally diminishes in length, and in some cases becomes quite short. The valves exhibit the usual structure, being densely reticulated by two sets of curved striæ, crossing each other at nearly right angles. Their edges are in the posterior part densely fringed with small

appressed denticles, which also cloth the spine on each side, and are continued along the posterior half of the dorsal edge. In the anterior part of each valve is seen the sigmoid shell-gland.

The head is of moderate size and, when seen laterally (fig. 2), of an almost semicircular form. As in most other species, it is not defined dorsally from the carapace by any distinct depression, though the dorsal edge appears very slightly concaved at the place where the carapace is beginning. It is surrounded by a distinct, though not very high crest, which forms the continuation of the dorsal crest of the carapace. The edges of this crest are quite evenly curved throughout, without forming any projection in front. The inferior part of the head is somewhat projecting, terminating in a very narrow and acuminate process, the so-called rostrum. Immediately above this, the posterior edge forms a slight angular prominence, from which the olfactory bristles of the antennulæ project. The fornix (see also fig. 1) is rather prominent in its posterior part, forming a shield-like expansion arching over the bases of the antennæ, and terminating on each side in a freely projecting angular corner. From the place where the fornix joins the carapace, an oblique line is seen running upwards, and meeting the one on the other side about where the matrix begins. These lines mark off a triangular dorsal area, inside which the heart is located (see fig. 1).

The eye is of moderate size, and located at a short distance within the frontal margin of the head. It exhibits a number of highly refractive crystalline bodies, about 6 of which are visible at the edge of the dark central pigment. The ocellus is very small, punctiform, and occurs at some distance behind the eye, at the inferior end of the cerebral ganglion.

The antennulæ (see fig. 3) are extremely minute and quite immobile, not projecting at all beyond the edges of the head.

The antennæ are, on the other hand, well developed, attaining about half the length of the body, and exhibit the usual structure, the natatory setæ being rather elongated and finely plumose.

The tail has dorsally (see fig. 2) 4 lamellar processes, of which the 2 anterior are the largest, and are distinctly separated at the base. Its terminal part (fig. 4), which, as usual, is abruptly bent downwards, tapers gradually to an obtuse point, which carries 2 strong curved claws, finely ciliated along their concave edge. The dorsal edge of this part is slightly flexuous, and armed in the outer half with a double series of denticles, 10—12 in each row. Between these denticles the anal orifice is located, and above them the dorsal face is densely clothed with very small appressed spikes. At the junction with the proximal part of the

tail, the 2 caudal setæ issue from an obtuse projection. These setæ are of moderate length and distinctly biarticulate, the outer part being densely ciliated.

The inner organs are fairly well distinguishable through the pellucid integuments, the intestine especially being very conspicuous by the darkening of its yellowish contents in its posterior part. The cœca, issuing from its anterior part, are rather large and exhibit a strong sigmoid bend.

The ephippium (fig. 5) has anteriorly a long stripe-like prolongation, which together with the dorsal hinge is densely fringed with small, appressed denticles. The egg-ampullæ are obliquely disposed, as in the European species, *D. magna.*

The shell is highly pellucid and nearly colourless, whereas the enclosed body exhibits a more or less distinct reddish tinge. The ova, when newly received into the matrix, have each a large central oil-globule surrounded by dark brownish green yolk-matter.

Description of the male.

The size of fully adult male specimens is very inferior to that of the female, being but little more than half as large.

The carapace (see fig. 6) is much narrower, and of an oblong form, with the dorsal margin nearly straight, and the ventral edges forming a strong curvature behind the middle. Anteriorly the free edges of the valves exhibit a projecting corner, which is densely clothed with delicate bristles, also continued for some distance posteriorly, and in this place the valves do not close, but are rather wide apart. The spine of the carapace is rather short and, as in the female, obliquely upturned.

The head has a very slight dorsal crest, whence its form becomes rather different from that in the female. It terminates with a somewhat projecting rounded frontal part, nearly filled up by the large eye. The inferior part of the head is, as it were, cut off, and does not exhibit any distinct rostrum.

The antennulæ (see fig. 7) are modified in the usual manner, forming freely movable appendages of a narrow cylindric form, and terminating, in front of the olfactory bristles, each with a well-marked setiform flagellum.

The 1st pair of legs (see fig. 6) are each armed at the end with a strong anteriorly curving hook, and terminate with a long plumose seta curving posteriorly and often exserted beyond the valves.

The tail does not exhibit any distinct process dorsally. Its terminal part (fig. 8) is somewhat curved and considerably tapered distally, with

the terminal claws comparatively smaller than in the female. The anal denticles are only 7 on each side, and densely crowded along a slight expansion of the dorsal edge, at some distance from the tip.

The testes are (see fig. 6) easily observable through the integuments as two narrow bags, one on each side of the intestine; their efferent ducts run along the ventral side of the tail and debouch at its tip.

The body is rather pellucid, though of a more pronounced reddish tinge than in the female, chiefly owing to numerous red oil-globules accumulated around the intestine.

Observations. Of this Daphnia, numerous specimens developed in some of my aquaria. At first, however, only a few female specimens appeared, being hatched from some of the ephippia contained in the dried mud received. But these specimens, after having become fully grown, rapidly multiplied in the usual parthenogenetical manner, and by successive generations, the aquaria at last literally swarmed with Daphniæ. During the last part of the summer most of the specimens became provided with ephippia, and at that time, I succeeded in detecting also male specimens, though their number was far from being large. At the close of the summer I allowed the water in the aquaria to dry up, and kept the bottom-residue in a dried state during the winter. On filling them again with water the following spring, the Daphniæ successively reappeared, being hatched from the ephippia deposited the preceding summer, and by rapid multiplication a similar series of generations was gained as in the preceding year. The experiment was repeated also the following summer, and with a similar result, no degeneration of the species being observable.

In habits, this form agrees with the other species of the genus, being constantly found suspended in the water, and moving about by short jerks or jumps effected by the rather rythmical strokes of the antennæ. As with other Daphniæ, the individuals of the earlier generations are both more prolific and more active in their movements than those of the later generations. Especially when the ephippia have been formed, do the movements become rather slow, and apparently serve only for keeping the animal suspended in the water. During the movements, the body is, as a rule, kept in a vertical attitude, the head upwards. The male, however, is often seen, during his pursuit of the females, to assume a more horizontal attitude, as shown in figure 6, and its movements are on the whole much more rapid than those of the female.

Occurrence. The mud that yielded this species, was taken on the 7th April, 1890 from a pond at Eyreton, North Canterbury district. It was

from the very same pond that the original specimens examined by Mr. Thomson were derived. This form has also been raised by the author from mud collected in a very different locality, viz., at Knysna, Cape of Good Hope.

Gen.: ***Simocephalus,*** Schödeler.

2. *Simocephalus obtusatus,* (Thomson).

(Pl. II).

Daphnia obtusata, Thomson, On the New Zealand Entomostraca. Trans. New Zeal. Institute, Vol. XI, p. 261, Pl. XI, fig. E, 2 a—e.

Specific Characters. Carapace of female rather tumid, seen laterally of an obliquely oval form, with the dorsal face quite evenly arched throughout and the posterior extremity obliquely truncated, posterior projection obtuse and slightly denticulate dorsally, occuring somewhat above the longitudinal axis. Carapace of male much narrower and slightly widening behind, with the posterior edge less oblique. Head in both sexes rather small and depressed, produced below to a rounded expansion, dorsal margin evenly curved throughout, without forming any projecting frontal part; fornix moderately broad. Eye considerably larger in male than in female. Ocellus small, rounded. Antennulæ and antennæ of the usual structure. Terminal part of tail in female rather broad at the base, outer part rapidly tapering, anal sinus well marked and defined above by an obtuse angle, anal denticles 8—10 on each side, terminal claws slender and armed in their proximal part with about 12 secondary denticles. Same part in male comparatively narrower, with the supra-anal angle more projecting. Colour ochraceous, being much paler in male than in female. Length of adult female $2^1/_2$ mm., of male scarcely exceeding $1^1/_2$ mm.

Remarks. The female of this species has been briefly described and figured by Mr. Thomson in the above quoted paper as *Daphnia obtusata.* It is, however, a true *Simocephalus,* agreeing in all essential points with the other species of this genus, though being easily distinguishable from any of them by the peculiar form of the head.

Description of the female.

The largest specimen examined measured in length about $2^1/_2$ mm., and the size of this species is accordingly about that of the European form *S. exspinosus.*

The general external appearance (see figs. 1 & 2) is that characteristic of the genus, the shell being rather stout and compact, and somewhat navicular in shape.

The carapace exhibits in a lateral view of the animal (fig. 1) a somewhat irregular, obliquely oval form, with the dorsal face quite evenly arched throughout, and the posterior extremity obliquely truncated. At the junction between the dorsal and posterior margins the carapace projects as an obtuse prominence slightly denticulated dorsally and placed somewhat above the longitudinal axis. The inferior contour of the carapace appears nearly straight in the middle, and bulges out considerably in front at the junction with the anterior edges, passing into the posterior ones by a less strong curvature. The free edges of the valves are, as usual, strongly inflected in the middle, appearing in a lateral view of the animal, as a well-marked line running somewhat within, and parallel to the inferior contour. They are fringed with delicate bristles, which are seen anteriorly and posteriorly projecting beyond the carapace. Seen from above (fig. 2), the carapace appears rather tumid, with the greatest width in front of the middle, and gradually tapering behind to an obtuse point.

The head (see fig. 1) is comparatively small and depressed, being, as in the other species, defined dorsally from the carapace by a small indentation. Its dorsal face is evenly vaulted throughout, and does not form any projecting frontal part anteriorly. The inferior part of the head is very unlike that in the other known species, its edge being not straight or incurved, but on the contrary strongly convex, forming a rounded, rostrum-like expansion projecting in front of the insertion of the antennulæ. In some specimens this expansion (see fig. 3) is somewhat angular in front, but more frequently the anterior edge of the expansion form together with the dorsal margin of the head a quite even and uninterrupted curve. There is no trace of the small recurved rostrum found in other species immediately below the insertion of the antennulæ. The fornix of the head (see fig. 2) is rather broad and shield-like, arching over the base of the antennæ, and joining the carapace at a very oblique angle (see figs. 1, 2, 3). From this angle, as in the genus *Daphnia*, a distinct line is seen running obliquely upwards and meeting the corresponding line on the other side, both together marking off a triangular dorsal area, inside which the heart is located.

The sculpturing of the shell is that usually met with in the species of this genus, consisting on the carapace of oblique striæ running parallel to the posterior edge, and in some places anastomosing with

each other, thus forming an irregular reticulation. On the inferior part of the head this reticulation is rather dense and also more regular than on the carapace.

The eye (see figs. 1 & 3) is of moderate size, and placed close to the front edge of the head. It exhibits several well-marked crystalline bodies, 6 or 7 of which are seen projecting at the edge from the central pigment. In a dorsal view of the animal (fig. 2), the eye shows itself to be composed of two well-marked halves, and is thus in reality double, though the halves are confluent in the middle. The ocellus is rather small and of a rounded oval form, being located at some distance behind the eye, close to the insertion of the antennulæ.

These last-named organs (see fig. 3) are of a somewhat conical form, and partly concealed by the anterior part of the valves. They terminate each with a bundle of delicate sensory bristles, and have besides anteriorly, near the base, a projecting nodule carrying a long and delicate olfactory filament.

The antennæ do not attain to half the length of the carapace and exhibit the structure characteristic of the genus, the upmost of the 3 apical setæ of the outer ramus being quite short and having the terminal part smooth and recurved in a hook-like manner.

The tail (see fig. 1) is comparatively large and broad, and carries dorsally two distant, recurved processes closing the matrix behind. Its terminal part (fig. 4) is much compressed and rather broad at the base, tapering rapidly, however, towards the end, which is obtusely pointed. The dorsal edge is somewhat convex in its proximal part, and forms, about in the middle, an obtuse angle. Below the latter occurs the anal sinus, which is armed with a double row of denticles rapidly increasing in size distally, each row containing from 10 to 12 denticles. The terminal claws are long and slender and but slightly curved. They are each (fig. 5) armed in the proximal half with about 12 well-marked secondary denticles, and have the outer part very finely ciliated on the concave edge. The caudal setæ are of moderate length, with the outer part densely ciliated.

The intestine is easily observable through the integuments by its yellowish contents, which become dark brown in its posterior part. The cœca issuing from its most anterior part are comparatively short and strongly incurved.

The ova, when newly received into the matrix, are perfectly globular and of a dark brownish green colour owing to the enclosed yolk-matter. The ephippium, as in the other species, exhibits an oval triangular

form and contains but a single ovum of an oval shape, its axis being placed longitudinally.

The colour of the body is light-yellow or ochraceous, with a more or less distinct olivaceous tinge along the back, and approaching an orange hue at the ventral side of the valves. In large specimens there are also a few irregular dark patches occurring on each side of the carapace.

Description of the male.

The length of fully adult male specimens does not exceed 1 1/2 mm., and is accordingly much inferior to that of the female.

The carapace is much narrower and also less tumid than in the female. Seen from the side (fig. 6), it exhibits an oblong quadrangular form, being somewhat broader behind than anteriorly, with the dorsal margin nearly straight, and the posterior one less oblique. The inferior edges are slightly sinuated in front of the middle, and bulge considerably less anteriorly. The posterior protuberance of the carapace is less conspicuous, and occurs considerably above the longitudinal axis, being, as in the female, denticulated dorsally. The head appears somewhat less depressed than in the female, but otherwise exhibits a very similar form.

The eye is very large, as compared with that of the female, whereas the ocellus does not differ in any point from that in the latter.

The antennulæ at first sight look very like those in the female. On a closer examination, however, they are found to be somewhat more fully developed, and provided anteriorly with 2, instead of a single nodule, each of them carrying a long sensory filament.

Each of the 1st pair of legs carries at the end a comparatively small, but distinct anteriorly curving claw.

The tail does not exhibit any dorsal processes. Its terminal part is considerably narrower than in the female, with the supra-anal angle somewhat more prominent, and the anal denticles fewer in number.

The testes occupy the normal place on each side of the intestine, and are pretty well distinguishable through the pellucid integuments.

The colour is considerably paler than in the female, and light yellowish.

Observations. This form developed in several of my aquaria, and in one of them has been domesticated during a space of no less than 4 years. Numerous generations have accordingly been watched during each season, exhibiting the usual succession in characters, the specimens of the earlier generations being very prolific, whereas those of the

succeeding generations became gradually unproductive. At the close of each season, most of the specimens had the ephippium developed, and at this time also, male specimens were found, though in no great number. In habits, this form agrees exactly with the other species. It is not very active, being generally found quietly attached with its back to the wall of the aquarium or to some plants growing in the same. When disturbed, it moves about by a perfectly even movement, the back always downwards, until it reaches another place to affix itself. For the purpose of attachment, the peculiarly modified, hook-like upmost seta of the outer ramus of the antennæ would seem to be of essential significance. The males, as usual, are much more active than the females, swimming about with considerable speed, though in the very same manner as the females.

Occurrence. The species was raised from the parcel of mud first received, and collected in February, 1890 from some lagoons in the neighbourhood of Dunedin. The specimens originally examined by Mr. Thomson were derived from the same locality. Out of New Zealand this species has not yet been recorded.

Gen. ***Ceriodaphnia,*** Dana.

3. *Ceriodaphnia sublævis,* G. O. Sars, n. sp.

(Pl. III, figs. 1—6).

Specific Characters. Carapace in female rather tumid and, when seen laterally, of a rounded quadrangular form, posterior projection but little prominent and occurring above the longitudinal axis, free edges of valves perfectly smooth; that of male narrower and more regularly quadrangular. Head defined dorsally from the carapace by a deep depression, being semi-erect, with a very slight sinus in the middle of the dorsal face, frontal part somewhat projecting and evenly rounded; edges of fornix perfectly smooth. Sculpture of shell very faint and not easily observable, though apparently of the usual reticulated kind. Eye rather large; ocellus small, punctiform. Antennulæ of female comparatively small, sensory filament of the anterior edge issuing at a short distance from the tip; those in male well developed, terminating with a distinct setiform flagellum. Terminal part of tail slightly tapering distally, anal denticles about 9 on each side, terminal claws each with about 8 secondary denticles in the middle. Body highly pellucid, with a very faint yellowish tinge. Length of adult female 1 mm., of male 0.55 mm.

Remarks. This new species is very nearly allied to the northern form, *C. reticulata* Jurine, differing, however, in the very faint sculpturing

of the shell (which indeed at first sight appears perfectly smooth), the quite evenly rounded frontal part, and the less prominent posterior projection of the carapace.

Description of the female.

Adult, ovigerous specimens scarcely exceed a length of 1 mm., and this form is accordingly somewhat inferior in size to the northern species, *C. reticulata*.

The general form of the body (see figs. 1 & 2), as in the other species of the genus, is rather short and stout, with the head sharply marked off from the carapace by a deep dorsal depression.

The carapace is rather tumid (see fig. 1), and exhibits, in a lateral view of the animal (fig. 2), a rounded quadrangular form, being but little longer than it is broad, and nearly transversely truncated posteriorly. The dorsal margin appears more or less curved according to the degree of distension of the matrix with eggs or embryos, whereas the ventral edges of the valves are nearly straight, passing into the anterior and posterior edges by a strong curvature. The posterior projection of the carapace is quite short and nearly rectangular, occurring considerably above the longitudinal axis.

The head is somewhat depressed, though not to such a degree as in some other species. The dorsal margin is strongly curved in its upper part, and exhibits, about in the middle, a very slight sinus. The frontal part is considerably produced and quite evenly rounded, without any trace of a rostral projection. The fornix is rather broad (see fig. 1), and has the edges evenly curved throughout.

The surface of the shell appears, when the animal is wholly immerged in water, perfectly smooth. Even viewed by very strong magnifiers, no sculpture is to be detected, except the usual small dots forming the exterior ends of the pillars uniting the 2 lamellæ composing the shell. But as soon as the valves become elevated above the water, a very delicate and somewhat irregular reticulation at once makes its appearance (fig. 3), showing it to be, in reality, sculptured in the manner characteristic of the genus, though this sculpture in the present case is extremely faint. The free edges of the valves are perfectly smooth throughout, without any denticles or bristles.

The eye is very large, almost entirely filling up the rounded frontal part of the head. It exhibits a number of distinct refracting bodies, partly projecting beyond the edges of the dark pigment.

The ocellus is very small, punctiform, and located at a short distance behind the eye, just in front of the insertion of the antennulæ.

The last-named appendages (see fig. 4) are comparatively small, though distinctly projecting and movably articulated to the lower side of the head. They terminate each in a bundle of delicate sensory bristles, and have besides, at a short distance from the tip anteriorly, a single, rather elongated filament arising from a knob-like projection.

The antennæ are well developed, being nearly as long as the carapace, and of the usual structure.

The tail has dorsally 3 short lamellar projections, the upmost of which is the largest, and serves for closing the matrix behind. The terminal part of the tail (see fig. 5) slightly tapers distally, being obtusely truncated at the tip. The anal denticles are rather feeble, somewhat curved, and but little different in size. Their number is 9—10 on each side. The terminal claws are rather strong, and each exhibits, at about the middle, a row of 8 distinct secondary denticles.

The whole animal is highly pellucid, with only a very faint yellowish tinge. The yolk of the ova and embryos contained in the matrix, generally exhibits a dark bluish green colour.

Description of the male.

Adult male specimens are, as usual, much inferior in size to the females, only slightly exceeding a length of $^1/_2$ mm.

The body appears (see fig. 6) on the whole narrower and less tumid, with the carapace of a more regularly quadrangular form, its upper contour being nearly straight, and with the head comparatively larger and more erect.

The antennulæ are considerably larger than in the female, forming each a cylindrical stem terminating in a distinct setiform flagellum.

The 1st pair of legs are, as usual, prehensile, being each armed with an anteriorly curving claw, and having besides a long apical seta generally projecting beyond the edges of the valves.

The tail is devoid of dorsal processes, and has the terminal part somewhat narrower than in the female, otherwise of a very similar structure.

The body, as in the female, is very pellucid, but exhibits a more pronounced reddish tinge, chiefly caused by numerous light red oil-globules accumulated around the intestine.

Observations. Of this form a few specimens were at first hatched on the 3rd July, 1890, in one of my aquaria. These, however, rapidly

multiplied during the remaining part of the summer, and the species re appeared also the next season, after the aquarium had been kept dry throughout the winter. In habits this form nearly agrees with the well-known northern species, *C. reticulata* and *quadrangula*, being apparently a true surface-water form. The animals were always found in the upper part of the aquarium and generally aggregated on the side that turned to the day-light. They here kept their bodies suspended in a vertical attitude by rhythmical strokes of their antennæ, whereby a somewhat jumping motion was effected. The males were somewhat more active in their movements, and often assumed a more prone attitude, as shown in the figure.

Occurrence. The species was raised from the same parcel of mud, that yielded the above-described *Simocephalus obtusatus*, and its occurrence, as yet known, is accordingly restricted to the lagoons in the neighbourhood of Dunedin. The Australian species, *C. honorata* (King), is unquestionably specifically distinct.

Fam.: *Lynceidæ.*

Gen.: ***Alona,*** Baird.

4. *Alona eucostata,* G. O. Sars, n. sp.

(Pl. III, figs. 7—10).

Specific Characters. Carapace of female rather compressed and, when seen laterally, oval quadrangular in form, posterior extremity transversely truncated, dorsal face arched, ventral edges nearly straight. Head semi-erect, hooded, terminating in a somewhat obtuse rostrum. Carapace of male considerably narrower, with the upper face less arched; head more erect. Surface of shell sculptured with very distinct elevated lines running longitudinally, about 20 on each side. Ocellus rather large, only slightly smaller than the eye. Antennulæ of female fusiform, reaching about to the tip of the rostrum; those in male much larger and projecting far beyond the rostrum. Antennæ comparatively short, scarcely attaining $^1/_3$ of the length of the carapace. Terminal part of tail in female somewhat lamellar, slightly dilated distally and obtusely truncated at the tip, with the posterior corner rounded off, supra-anal angle well marked, anal denticles about 12 on each side, being very feeble, sublamellar, and divided into several setiform points, terminal claws rather strong, each with a slender denticle at the base. Same part in male comparatively shorter and thicker, almost cylindric in form,

anal denticles subobsolete, terminal claws rather small. Colour pale corneous. Length of adult female 0.48 mm., of male 0.38 mm.

Remarks. The present species somewhat resembles the northern form, *A. rectangula* G. O. Sars, but is easily distinguishable by the rather different structure of the tail, and by the much more distinct, and also more dense striation of the shell, which latter characteristic has given rise to the specific name.

Description of the female.

The length of adult, ovigerous specimens amounts to 0.48 mm., and this form accordingly grows to a somewhat larger size than the northern species *A. rectangula*.

The carapace is rather compressed and, when seen from the side (see fig. 7), of an oval quadrangular form, being somewhat broader in front than posteriorly. The dorsal face is strongly arched, whereas the inferior edges of the valves are nearly straight. Posteriorly the carapace is almost transversely truncated, forming, both superiorly and inferiorly, a well-marked angle.

The head exhibits the usual hood-like shape, having on each side a well-marked, shelf-like projecting border, the fornix, arching over the bases of the antennulæ and antennæ, and joining the carapace at a very acute angle. It is quite immobile and semi-erect, with the dorsal face evenly vaulted and continuous with that of the carapace, and it terminates in an obtusely acuminate rostrum, somewhat projecting beyond the inferior edges of the carapace. In a dorsal or ventral view of the animal, however, this rostrum appears blunted at the tip.

The surface of the shell is sculptured on each side with about 20 very distinct elevated lines running longitudinally and in some places, especially at the infero-anteal corners, anastomosing with each other. The ventral edges of the valves, as in most other species, are fringed with a dense row of delicate bristles.

The eye, occuring near the dorsal face of the head, is rather small, and the refracting bodies are few in number and not very distinct.

The ocellus is nearly of same size as the eye, and located a little nearer the latter than the tip of the rostrum. It is of a somewhat irregular, angular form, and does not exhibit any trace of refracting bodies.

The antennulæ are of the usual subfusiform shape, and extend about to the tip of the rostrum. In addition to the usual apical bundle

of sensory bristles, another delicate bristle is seen issuing at some distance from the tip anteriorly.

The antennæ are comparatively short, not even attaining $^1/_3$ of the length of the carapace, and they exhibit the usual structure.

The labrum forms below a very large, lamellar expansion of an almost securiform shape, extending between the rostrum and the anterior edges of the carapace.

The terminal part of the tail (fig. 8), as in other Lynceidæ, is sharply defined from the proximal part, being connected with the latter by a very movable articulation. It is somewhat lamellar, being rather broad in its outer part, and obtusely truncated at the tip, with the posterior corner rounded off. The supra-anal angle is well-marked, and occurs considerably above the middle of the dorsal edge. The anal denticles are about 12 on each side, occupying the outer third part of the dorsal edge, in front of the anal orifice. They are very feeble, sublamellar, and divided at the tip into several setiform points. The terminal claws are very strong and horn-coloured, having each at the base a slender secondary denticle. The caudal setæ issue from a small tubercle close to the articulation between the terminal and proximal parts of the tail; they are very small, though distinctly biarticulate.

The ova contained in the matrix are generally two, placed side by side, or the one somewhat in front of the other.

The body is very pellucid and of a pale corneous colour. Within it the intestine is plainly observable, being rather dilated in its anterior part, and forming in the middle nearly a double twist.

Description of the male.

As is usually the case, the adult male is much inferior in size to the female, scarcely exceeding a length of 0.38 mm.

The form of the body (see fig. 9) is comparatively narrower, with the dorsal face not nearly so strongly arched as in the female, and with the head larger and more erect. The inferior edges of the valves exhibit in front of the middle a slight angular bend, and the posterior edges appear somewhat obliquely truncated.

The ocellus occurs almost exactly in the middle between the eye and the tip of the rostrum, which latter appears somewhat more blunted than in the female.

The antennulæ are comparatively much larger and thicker than in the female, projecting considerably beyond the rostrum.

The 1st pair of legs terminate each with a very strong, anteriorly curving claw, which is deeply horn-coloured and projects beyond the valves inferiorly.

The terminal part of the tail (fig. 10) is not lamellarly expanded, but is nearly cylindric in form, though having the supra-anal angle distinct. Of the anal denticles only very slight traces are found on the lateral faces, and the terminal claws are also considerably smaller than in the female. In front of these claws the ventral edge forms an angular projection containing the opening for the efferent ducts of the testes.

The body is still more pellucid than in the female, and almost colourless.

Observations. This form developed in some of my aquaria in considerable abundance, and in one of them has been domesticated during a space of 4 years. As is the case with most other Lynceidæ, it is a true bottom-form, being generally found among the loose bottom material, through which it moves with great dexterity by the aid of its antennæ and its powerfully developed tail. On taking up, by the aid of a dipping tube, a small portion of mud from the bottom of the aquarium, and placing it in a watch-glass with a little water, I was almost sure to get several specimens of this form. They very soon made their appearance, slowly swimming out of the mud and assembling on the side of the glass that was turned to the day-light. The movements of the animal appear as a perfectly even dart through the water effected by rapidly repeated strokes of the antennæ, whereby the body is generally kept in a horizontal attitude, the back turned downwards. On reaching the surface, the animal very often suddenly floats up, with the one valve quite out of the water, without being able again to submerge its body, and it is in such cases very easy to detect, in spite of its small size.

Occurrence. The species was only raised from one of the parcels of mud received, viz., that taken from lagoons in the neighbourhood of Dunedin, and this is accordingly the only locality as yet known, where this form is stated to occur.

5. *Alona macrocopa*, G. O. Sars, n. sp.

(Pl. III, figs. 11—15).

Specific Characters. Carapace of female less compressed than in the preceeding species, and seen laterally of a somewhat irregular, rounded quadrangular form, with the dorsal face boldly arched and the inferior edges subangular in front of the middle, posterior extremity

transversely truncated. Head somewhat erect, and terminating in a rather projecting rostrum. Carapace of male, as usual, less broad than in female, otherwise of a rather similar shape. Surface of shell sculptured with rather distinct, longitudinal lines, about 15 on each side, upper part in specimens carrying winter-eggs rather regularly reticulated; inferior edges of valves fringed with delicate bristles. Ocellus somewhat smaller than the eye. Antennulæ rather slender, though in female not nearly reaching to the tip of the rostrum. Antennæ unusually strongly developed, being about half as long as the carapace, and having the outmost apical seta of each ramus very strong and elongated. Terminal part of tail in female short and thick, scarcely expanded distally, extremity obliquely truncated, supra-anal angle well marked, anal denticles very feeble, setiform, and apparently arranged in several rows, terminal claws of moderate size, each with a small secondary denticle at the base. Same part in male much narrower, and gradually tapering to an obtuse point, supra-anal angle obsolete, anal denticle wholly absent, terminal claws extremely small and without any secondary denticle. Body of a distinct yellowish or corneous colour, upper part of carapace in females carrying winter-eggs very darkly coloured. Length of adult female 0.39 mm., of male 0.28 mm.

Remarks. This is a very distinct species, showing some points of resemblance to the genus *Alonella*, though undoubtedly being more properly referable to the genus *Alona*. The most striking characteristic is the unusually strong development of the antennæ, which feature, indeed, has given rise to the specific name.

Description of the female.

The length of fully adult, ovigerous specimens does not exceed 0.39 mm., and this species is accordingly rather inferior in size to the pre ceding one.

The carapace is less compressed than in that species, and also shorter and stouter. When seen laterally (fig. 11), it exhibits a somewhat irregular form, being considerably broader in front than behind. The dorsal face is boldly arched in the middle, and the inferior edges of the valves exhibit in front of the middle an abrupt, almost angular curve. The posterior extremity of the carapace is nearly transversely truncated, with both the upper and lower angle well defined.

The head appears somewhat flattened in front and is more erect than in the preceding species. It terminates in a rather projecting

acute rostrum, which, however, in a dorsal or ventral view of the animal appears more blunted, on account of the extremely prominent fornix.

The sculpture of the shell consists, as in the preceding species, of a number of longitudinal, elevated lines, about 15 on each side, which in the posterior part of the carapace are very distinct, but anteriorly partly anastomose with each other, forming an irregular net-work. The dorsal part of the carapace in specimens carrying winter-eggs exhibits a rather different sculpture, being reticulated with rather regular hexagonal meshes. The inferior edges of the valves carry the usual fringe of cilia, but in their anterior part the cilia become strongly inflected, not being visible outside the edges.

The eye is of moderate size and occupies its normal place.

The ocellus is considerably smaller than the eye, and located much nearer it than the tip of the rostrum.

The antennulæ are narrow fusiform in shape, and do not extend to the tip of the rostrum.

The antennæ (fig. 12) are remarkable by their unusually strong development, attaining (without the setæ) to half the length of the carapace. The basal part consists of 2 segments, very movably articulated with each other, the first of which is covered by the fornix of the head (see fig. 11). Both rami are, as usual, 3-articulate, and the outer one somewhat longer than the inner. Each ramus carries at the tip a short spine and 3 very much elongated setæ, the outer of which is particularly strong, and horn-coloured. The 1st joint of the inner ramus has also, at the end inside, a short spine, and each of the 2 proximal joints of the outer ramus at the end outside, a much stronger spine, that of the 2nd joint especially being of very considerable length.

The lamellar expansion of the labrum is somewhat smaller than in the preceding species, but exhibits a similar securiform shape.

The terminal part of the tail (fig. 13) is comparatively short and stout, being scarcely expanded distally. Its extremity is obliquely truncated, with the posterior corner much less produced than the anterior, and obtuse-angular. The supra-anal angle is rather projecting, and occurs about in the middle of the dorsal edge. The anal denticles are very delicate, setiform, and apparently arranged in several rows, their exact number being rather difficult to determine. The terminal claws are not very strong, but are each armed at the base with a small secondary denticle.

The body is less transparent than in the preceding species, and of a distinct yellowish or corneous colour. In females carrying winter-eggs the dorsal part of the carapace assumes a very dark, almost black hue.

Description of the male.

Adult male specimens do not exceed a length of 0.28 mm., and are also of a much paler colour than the females.

The carapace, as usual, exhibits (see fig. 14) a comparatively narrower form, the dorsal face being less strongly arched, and the head appears somewhat larger in proportion to the carapace, and also more erect.

The ocellus is located about midway between the eye and the tip of the rostrum.

The antennulæ are larger and thicker than in the female, and project considerably beyond the rostrum.

The 1st pair of legs are each armed with a very strong, horn-coloured claw, curving anteriorly and projecting beyond the edges of the valves.

The terminal part of the tail (fig. 15) is very unlike that in the female, being much narrower and of a somewhat conical form, with no distinct supra-anal angle. Its outer part gradually tapers to an obtuse point, and is wholly devoid of anal denticles. The terminal claws are extremely minute and without any trace of the secondary denticle occurring in the female. Immediately in front of them, the opening for the efferent ducts of the testes has its place.

Observations. This form only developed in one of my aquaria, but there it rapidly multiplied and continued to live during the whole summer. It also reappeared the next season, after the aquarium had been kept in a dry state during the winter.

In its movements it considerably differs from the other known *Alonæ*, and in this respect much more resembles certain species of the genus *Alonella*, for instance *A. exigua* Lilljeborg. It swims rather rapidly by abrupt jerks effected by rhythmical strokes of the powerful antennæ. Otherwise its habits agree with those of the other species.

Occurrence. The mud from which this interesting form was raised, was taken from some lagoons and ditches at Kaitaia, in the far north position of the North Island of New Zealand. This is the only locality where the species, as yet, has been stated to occur.

Order: **Ostracoda.**

Suborder: **Podocopa.**

Fam.: *Cypridid*æ.

Gen.: ***Cypris,*** Müller.

6. *Cypris bennelong,* King.
(Pl. IV, fig. 1 a—d).

Cypris bennelong, King: «On Australian Entomostracans»; Papers & Proceedings of the Royal Society of Van Diemen's Land, Vol. III, Part 1, p. 63, Pl. X. A.

Chlamydotheca australis, Brady: «Notes on Fresh-water Entomostraca from South Australia». Proceed. Soc. London, 1866, p. 91, Pl. IX, figs 4—8.

Specific Characters. Shell rather tumid and densely hairy, seen laterally of an oval triangular form, with the greatest height about in the middle, dorsal margin boldly curved and almost angular in the middle, ventral one very slightly sinuated in the middle and having another sinus near the anterior extremity, the latter obliquely rounded and considerably produced at the inferior corner, posterior extremity narrower and more regularly rounded: seen from above ovate, about twice as long as broad, anterior extremity narrowly produced and somewhat twisted, posterior extremity obtusely rounded. Valves very unequal, the left being much the larger and overlapping the right especially at the anterior extremity, where it forms a somewhat deflexed, almost beak-like prolation; edges of right valve slightly crenulated anteriorly and posteriorly. Surface of shell smooth, being only marked with small depressed pits. Natatory setæ of both pairs of antennæ very much elongated. Caudal rami narrow, linear, nearly straight; claws slender and smooth, the apical one about half the length of the ramus. Colour dark brownish green. Lengt of adult female 1.42 mm.

Remarks. The identification of this form with that described by King may perhaps appear somewhat doubtful. Yet, having received, through the kindness of Mr. Whitelegge, a number of well-marked specimens of this Cypris collected in the same tract where the Rev. R. L. King made his investigations, I am much inclined to believe that his *Cypris bennelong* is a young specimen of the species here treated of. The *Chlamydotheca australis* of Brady is quite certainly this species. The

genus *Chlamydotheca* ought, however, to be discarded, as it is only founded upon unessential characters derived from the shell. The present form is in reality a true Cypris, both according to the shell and the structure of the enclosed animal.

Description of the female.

The length of the shell in fully adult specimen measures 1,42 mm., and this form accordingly belongs to the middle-sized species.

The shell is rather tumid and everywhere densely pilose, though more so at both extremities.

Seen from the side (fig. 1 a), it exhibits an oval triangular form, the greatest height, which occurs about in the middle, considerably exceeding half the length. The dorsal margin is boldly curved, being almost angular in the middle, and slopes rather steeply to the anterior extremity, somewhat more gently to the posterior one. The ventral margin is nearly straight, though, on a closer examination, exhibiting a very slight sinus in the middle and another near the anterior extremity. The latter is obliquely rounded, and projects considerably at the lower corner, forming, as it were, an obtuse, beak-like prominence, which, however, is only due to the left valve, which at this place considerably overlaps the right. The posterior extremity is obtusely rounded and somewhat narrower than the anterior. Seen from above (fig. 1 b), the shell exhibits an oblong ovate form, with the breadth about equalling half the length, and the side-contours nearly straight and parallel in the middle. The anterior extremity appears much narrower than the posterior, and terminates in a somewhat twisted point formed by the beak-like projection of the left valve.

The valves are very unequal both as to size and shape, more so, indeed, than in any of the other known species. The left valve is much the larger, and overlaps the right both at the posterior and anterior extremity, as also along the ventral side (see fig. 1 a). Especially is the anterior extremity of this valve peculiarly modified, forming below a narrowly rounded, almost beak-like expansion projecting far beyond the corresponding edges of the right valve. Inside, this expansion is marked off by an elevated ridge, against which the edges of the right valve apply, when the shell is closed. The right valve has the anterior extremity quite evenly rounded, without any trace of a beak-like expansion below, but at this place it is provided with a row of small tubercles. The posterior part of the ventral edge of this valve exhibits a similar tuberculated or crenulated appearance.

The surface of the shell is quite smooth, exhibiting only the usual small depressed pits. About in the centre of each valve a number of light spots are observable. These spots, caused by the strong adductor muscle of the shell, agree exactly, both in number and arrangement, with those in other species of the genus.

The eye in living specimens is easily observable through the shell, ocurring at the usual place, near the dorsal face and somewhat in front of the middle.

Likewise some of the appendages of the enclosed animal may at times be observed partly stretched out from the valves, viz., the outer part of the 2 pairs of antennæ, the 1st pair of legs, and the caudal rami. But in order to examine the several appendages more closely, the valves ought to be separated and the animal extracted, and either be mounted at once in Canada balsam, or submitted to a regular dissection. By both proceedings it may be easily shown that the structure of the animal does not differ in any essential manner from that met with in typical species of *Cypris*, and that consequently the present species ought to be included in the same genus.

As in the other species of the genus, the setæ of the superior antennæ are very much elongated, forming a dense brush, and the natatory setæ attached to the end of the antepenultimate joint of the inferior ones, are also very fully developed, projecting far beyond the terminal claws, and being densely plumose.

The oral parts do not differ in any way from those in other species, and the first pair of maxillæ (see fig. 1 c) exhibit the slender narrow form of both the palp and the masticatory lobes characteristic of the genus.

Likewise the 2 pairs of legs are found to be of the very same appearance as in the typical species of the genus.

The caudal rami (fig. 1 d) are long and slender, nearly straight, and carry, as usual, each 2 slender claws and 2 small setæ, one of which issues from the tip immediately in front of the apical claw, the other from the dorsal edge, at a short distance behind the other claw. As usual, the apical claw is the longer of the two, equalling in length about half the ramus.

The colour of the shell is a rather uniform dark brownish green.

Only female specimens have hitherto come under my observation, and I am much inclined to believe, that, as would seem to be the case with most other species of this genus, males do not exist at all, the species being in all probability exclusively parthenogenetical.

Observations. Some specimens of this form were hatched in two of my aquaria and continued to live during the whole summer. They did not, however, multiply to any great extent, and the species was not observed the succeeding seasons.

In habits, it agrees with the other species of the genus, being a rather active animal. It swims about with great ease by the aid of the long natatory setæ of the antennæ, at times, however, affixing itself to the walls of the aquarium or to the plants growing in the same, in search of food.

Occurrence. The mud from which this form was raised, was the same parcel that yielded the above-described *Alona macrocopa*, being collected at Kaitaia in the North Island of New Zealand.

The species also occurs in the neighbouring continent of Australia, being at first observed by the Rev. King in a «pond near Sydney Cove, close to the edge of the Saltwater», and subsequently collected by Mr. Whitelegge in water-holes off Burke Street, Waterloo. The specimens examined by Mr. Brady were collected by Prof. R. Tate at Penola, South Australia.

7. *Cypris sydneia*, King.

(Pl. IV, fig. 2 a—c).

Cypris sydneia, King, l. c. p. 65, Pl. X. M.

Cypris ciliata, Thomson, On the New Zealand Entomostraca. Trans. N. Zeal. Inst. Vol. XI, p. 253, Pl. XI, fig. A, 1 a—g.

Specific Characters. Shell moderately tumid and rather densely clothed at both extremities with delicate hairs, seen laterally oval reniform, with the greatest height behind the middle, dorsal margin strongly curved, ventral slightly sinuated in the middle, anterior extremity quite evenly rounded, posterior somewhat broader and blunted. Valves slightly unequal, the left one somewhat overlapping the right at both extremities; edges of right valve distinctly crenulated both anteriorly and posteriorly. Surface of shell smooth, polished, with a few small, scattered pits. Natatory setæ of the antennæ well developed, though somewhat shorter than in the preceding species. Caudal rami of moderate length and slightly flexuous, apical claw not attaining half the length of the ramus. Colour yellowish, changing to orange or reddish brown. Length of shell 1.36 mm.

Remarks. The short description and figure given by the Rev. R. L. King of his *Cypris sydneia* apply rather well to the above characterised

form, and as I have received from Mr. Whitelegge numerous specimens of this Cypris collected by him in the very same tract, where Mr. King made his investigations, I cannot doubt the identity of both forms. It seems also most probable that the *Cypris ciliata* of Thomson, and perhaps also *C. novæ-zealandiæ* Baird, is the same species. Both in the form and the colour of the shell, it looks very like the well-known European species, *C. iucongruens* Rambdohr, and may, indeed, turn out to be identical with it.

Description of the female.

The length of the shell in fully adult specimens measures 1.38 mm., and accordingly this form is somewhat smaller than the preceding one.

The shell is moderately tumid and finely hairy, especially at both extremities. Seen from the side (fig. 2 a), it exhibits an oval reniform shape, being somewhat broader behind than anteriorly, with the greatest height, which occurs behind the middle, somewhat exceeding half the length. The dorsal margin is rather evenly curved, sloping somewhat more steeply in front than behind, whereas the ventral margin appears nearly straight, though exhibiting a slight concavity in the middle. The anterior extremity is quite evenly rounded, the posterior one is somewhat broader and more blunted. Seen from above (fig. 2 b), the shell exhibits an oblong ovate form, with the greatest breadth scarcely attaining half the length and ocurring considerably behind the middle. Both extremities appear somewhat blunted, but the posterior one is considerably broader than the anterior.

The valves are somewhat unequal, though not nearly to such an extent as in the preceding species. As in the latter, the left valve is the larger, and overlaps the right at both extremities, as also along the ventral side. Its anterior extremity does not, however, project nearly so far beyond that of the right valve, as is the case in the preceding species, and does not form any beak-like expansion below. The right valve has the edge distinctly tubercular or crenulated both anteriorly and posteriorly, as also, along the posterior part of the ventral side.

The surface of the shell is quite smooth and polished, exhibiting only the usual small pits, which are few in number and rather scattered. The light spots in the centre of each valve are precisely as in the preceding species.

The structure of the several appendages also nearly agrees with that in the before-mentioned species, except that the natatory setæ of the antennæ are somewhat shorter.

The caudal rami (fig. 2 c) are less slender than in the preceding species and somewhat flexuous; the claws too are less elongated, the apical one not nearly attaining half the length of the ramus.

The colour is a light-yellow or orange, with a somewhat darker, reddish brown shadow across the back. The ovarian tubes shine through the shell with a light reddish hue.

Observations. Of this species numerous specimens developed in my aquaria, multiplying in some of them to a truly enormous extent. The species also reappeared during several succeeding seasons, after the aquaria had been kept in a dry state during the winter. Although I have thus had an opportunity of watching the species during numerous successive generations, not a single male specimen could ever be detected, and I am therefore induced to believe, that this form, like most other species of the genus Cypris, is exclusively parthenogenetical.

As to its habits, this species is not nearly so active as the preceding one, being most frequently found creeping on the bottom or up the walls of the aquarium. The animal is, however, by no means devoid of swimming power, and may at times be seen moving about in the water rather quickly. The eggs are deposited in irregular clusters on the walls of the aquarium or on any other objects, to which they adhere very firmly. They are of a reddish colour and covered by a rather thick and hard capsule. Some of them were at once hatched, but the greater part did not develop before the succeeding season.

Occurrence. This form was raised from every one of the parcels of mud received, and is accordingly stated to occur in the following localities in New Zealand: 1) Lagoons in the neighbourhood of Dunedin, 2) Pond at Eyreton, North Canterbury district, 3) Ditches at Kaitaia in the North Island. From the first 2 localities it has also been recorded by Mr. Thomson. As above stated, the species also occurs in the neighbouring continent of Australia, having been at first observed by the Rev. R. L. King, who collected it in a swamp near Wooloomooloo Bay, Sydney. Subsequently it was taken by Mr. Whitelegge very abundantly at Bourke Street, Sydney, and the specimens kindly sent me for examination.

Gen.: ***Cypridopsis,*** Brady.

8. *Cypridopsis minna,* (King).

(Pl. IV, figs. 3 a—d).

Cypris minna, King, l. c. p. 64, Pl. X, B.
Cypridopsis minna, Brady, l. c., p. 91, Pl. X, figs. 1—3.

Specific Characters. Shell exceedingly tumid, the width considerably exceeding the height, and but sparsely pilose, except at both extremities; seen from the side, almost semicircular in form, dorsal margin boldly curved, ventral nearly straight, both extremities evenly rounded: — seen from above or from below, almost circular in outline, anterior extremity somewhat narrowed, posterior broadly rounded. Valves slightly unequal, the right one being the larger and exhibiting in front a thin border projecting beyond the edge of the left valve, both valves having within the anterior edge a number of very conspicuous dark, radiating lines. Surface of shell smooth, with only a few very small pits. Eye very broad, its pigment forming a narrow transverse, band-like stripe. Caudal rami small and exceedingly narrow, with 2 distinct but very slender and setiform claws. Colour olivaceous, changing to light yellowish brown, with indistinct darker shading. Length of adult female 0.89 mm.

Remarks. It would seem that the Rev. R. L. King has comprised under the name *Cypris minna* several distinct species, for he says that some specimens are of a transparent green colour, whereas others are dark brown, and finally he mentions a larger variety of a bright chestnut colour. These 3 forms, indeed, he supposes may more properly be as many species. The form here described seems to be that recorded by Mr. Brady as *Cypridopsis minna.* It may be easily distinguished from any of the other known species by its exceedingly tumid shell and its yellowish brown colour.

Description of the female.

Fully adult specimens attain a length of 0.89 mm., and this species accordingly somewhat exceeds the northern form, *C. vidua,* in size.

The shell is exceedingly tumid, more so indeed than in any other of the known species, its width even considerably exceeding the height, whence it acquires a somewhat depressed appearance. For this reason, it is also very difficult to get a correct lateral view of the shell. When brought under the microscope in a small quantity of water, it always

presents itself either in a dorsal or a ventral position, and if any attempt is made to turn it over, it generally gives an incomplete and more or less oblique lateral view. This may have been the reason why the profile figures given both by King and M. Brady happen to be less correct, the height being much too great in proportion to the length. If a correct side-view is obtained (fig. 3 a), the shell exhibits an almost semicircular form, the greatest height occurring a little behind the middle, and about equalling $^2/_3$ of the length. The dorsal margin is boldly curved, sloping somewhat more steeply behind than anteriorly, whereas the ventral margin appears quite straight, without any perceptible sinus in the middle. Both extremities are evenly rounded and nearly equal. Seen from the dorsal (fig. 3 b) or ventral face (fig. 3 c), the shell exhibits a very broad ovate or nearly circular form, the greatest width almost equalling the length. The anterior extremity appears somewhat narrowed, whereas the posterior one is broadly rounded, its edges forming, along with the lateral contours, a perfectly even and uninterrupted curve.

The valves are a little unequal, the right one being somewhat larger than the left, and overlapping it along the anterior extremity (see fig. 3 a), where it forms a thin border projecting beyond the corresponding edge of that valve. Inside the anterior edge both valves exhibit a number of very conspicuous, dark, radiating lines. These lines extend in the left valve to the edge, whereas in the right they terminate at the origin of the above-mentioned projecting border. When viewed ventrally (fig. 3 c), the right valve is found to form, in the middle of the ventral face, a tongue-like expansion, advancing, if the shell be closed, over the corresponding part of the left valve.

The surface of the shell appears quite smooth and polished, though, on a closer examination, a few small and indistinct pits may be found to exist. It is but sparingly pilose in its middle part, but at both extremities a rather dense clothing of delicate hairs is observable. Near the centre of each valve, though somewhat more ventrally, the usual light spots, caused by the adductor muscle of the shell, are seen. They agree both in number and arrangement with those in the preceding genus.

The eye, when viewed dorsally (see fig. 3 b), exhibits a somewhat unusual form, its pigment having the appearance of a transverse, almost band-like stripe, which carries at each extremity the highly refractive lenses.

The structure of the several appendages does not seem to differ from that found in other species of the genus. As in these, both pairs of

antennæ are provided with exceedingly long and slender natatory setæ, and the caudal rami (fig. 3 d) are normally developed, though they are rather small and narrow, with the terminal claws setiform.

The colour is generally found to be a light yellowish brown, changing to olivaceous. There are no distinct transverse bands, as in most other species, but only some irregular shades, one of which occurs in the centre of the shell, the others at both extremities.

Observations. Several specimens of this form developed in my aquaria and were watched during numerous successive generations. But only female specimens were found, and the species is accordingly most probably exclusively parthenogenetical.

In habits it agrees with the other species, being rather active and very well adapted for moving through the water. It is often, however, found slowly creeping up the walls of the aquarium or along the plants growing in it, in search of food. When disturbed, it swims about with considerable speed, to find another place.

Occurrence. The mud from which this form developed, was the same parcel that yielded the above-described *Cypris bennelong*. Its occurrence in New Zealand is accordingly, as yet known, restricted to the North Island, at Kaitaia. The species was first observed by the Rev. King in the neighbourhood of Sydney, and was subsequently recorded by Mr. Brady from the Condong River, South Australia. Moreover the same form has been raised by the author in great abundance from dried mud collected in China.

9. *Cypridopsis viridis*, (Thomson).

(Pl. IV, figs. 4a—c).

Cypris viridis, Thomson, On the New Zealand Entomostraca: Trans. N. Zeal. Institute, Vol. XI, p. 253, Pl. XI, figs. A. 2 a—g.

Specific Characters. Shell moderately tumid and everywhere densely pilose: — seen from the side, rounded oval in form, height about equalling $^2/_3$ of the length, dorsal margin somewhat irregularly curved, ventral straight, anterior extremity narrower than the posterior, which is obtusely blunted: — seen from above regularly ovate in outline, width about equalling $^3/_4$ of the length, anterior extremity narrower than the posterior. Valves, as in the preceding species, slightly unequal, the right one exhibiting in front a thin border projecting beyond the corresponding edge of the left, radiating lines well-marked. Eye less broad than in *C. minna*. Caudal rami somewhat larger, but of a structure

similar to that in the latter species. Colour dark green, with irregular clouds of a still darker hue. Length of adult female 0.95 mm.

Remarks. The above characterised form is undoubtedly that described by Mr. Thomson as *Cypris viridis*. It is, however, a true *Cypridopsis*, agreeing in all essential points with the other species of this genus. It is most likely that the species was also observed by the Rev. R. L. King, but was regarded as merely a variety of *C minna*. From the latter it is at once distinguished by its densely pilose and far less tumid shell, as also by the very different colour. It moreover grows to a considerably larger size.

Description of the female.

The length of fully adult specimens amounts to 0.95 mm., and this form accordingly belongs to the larger-sized species of the genus.

The shell is not nearly so tumid as in the preceding species, its width but little exceeding its height. It is pilose all over, and especially at both extremities are the hairs very densely crowded.

Viewed from the side (fig. 4a), the shell exhibits a somewhat irregularly oval form, with the greatest height about equalling $^2/_3$ of the length, and occurring nearly in the middle. The dorsal margin is boldly curved, and slopes somewhat more steeply in front than posteriorly. The ventral margin, as in the preceding species, appears almost straight. The anterior extremity is narrowly rounded in front, whereas the posterior appears obtusely truncated. Seen from above (fig. 4 b), the shell exhibits a rather regular ovate form, with the greatest width about in the middle, and scarcely exceeding $^3/_4$ of the length. The anterior extremity is somewhat narrower than the posterior, which is broadly rounded.

The valves, as in the preceding species, are slightly unequal, the right one being the larger, and exhibiting anteriorly a similar, projecting, thin border. The radiating lines inside the anterior edges are well-marked.

The surface of the shell is smooth, though, on a closer examination, a number of small pits may be observed.

The eye, seen dorsally (fig. 4 b), is less broad than in *C. minna*, though otherwise of a similar structure.

The caudal rami (fig. 4 c) are somewhat larger, but exhibit the slender form characteristic of the genus.

The colour is a very dark green, clouded with irregular shades of a still darker hue.

Observations. This form developed in great abundance in some of my aquaria, and in one of them, has been domesticated for a space of no less than 4 years, reappearing in each season after the aquarium had been kept in a dry state during the preceding winter. Only female specimens were found, and this species is accordingly most assuredly exclusively parthenogenetical. In habits, it exactly agrees with the preceding species.

Occurrence. The species was raised from 2 of the 3 parcels of mud received, and its occurrence in New Zealand may thereby be stated to be as follows: 1) Lagoons in the neighbourhood of Dunedin, 2) Ditches at Kaitaia in the North Island. Mr. Thomson observed the species in the first of these localites. Moreover the species occurs in the neighbouring continent of Australia, having been collected by Mr. Whitelegge in waterholes off Bourke Street, Sydney, and most probably also by the Rev. R. L. King in about the same tract.

Gen.: ***Candonocypris,*** G. O. Sars, n.

Syn: Herpetocypris, G. O. Sars (part).

Generic Characters. Shell smooth and moderately compressed, being of an oblong form, with the height not attaining half the length. Valves rather unequal, the right one being the larger and considerably overlapping the left in front, sometimes also posteriorly, edges of both valves smooth, inner duplicatures of the anterior extremity rather broad, that of right valve defined from the projecting border by an elevated ridge. Natatory setæ of the superior antennæ rather elongated, those of the inferior antennæ, on the other hand, poorly developed and not extending beyond the terminal claws. First pair of maxillæ with the masticatory lobes very short and thick, palp rather large, having the proximal joint dilated distally, terminal joint broader than it is long, and obliquely truncated at the tip, which carries a restricted number of claw-like spines. Caudal rami nearly as in the genus *Cypris*. Propagation exclusively parthenogenetical.

Remarks. This new genus is established, to receive the form described by the author at an earlier date as *Herpetocypris stanleyana*. Having recently examined more closely the type of the genus *Herpetocypris* Brady & Norman, *H. reptans* Baird, I find, that in fact this form differs so very markedly both as to the shell and the animal, as not properly to be regarded as congeneric with the above-named Australian species. In *H. reptans*, for instance, the left valve is the

larger, considerably overlapping the right both anteriorly and along the ventral side, whereas in the Australian form the case is entirely the reverse. Moreover, in *H. reptans* the 1st pair of maxillæ are very different, agreeing closely with those in the genus Cypris, both as to the form of the palp and the masticatory lobes. Of the present genus 2 nearly-allied species were raised from the mud received.

10. *Candonocypris candonoides,* (King).

(Pl. V, figs. 1 a—c).

Cypris candonoides, King, l. c., p. 66, Pl. X. F.

Herpetocypris stanleyana, G. O. Sars, On some Ostracoda and Copepoda raised from dried Australian mud. Christiania Vid. Selsk. Forhandl. 1889, p. 35, Pl. II, figs. 1—2, Pl. V, figs. 5 - 7.

Specific Characters. Shell seen laterally oblong reniform, tapering anteriorly, greatest height behind the middle, dorsal margin evenly curved, ventral slightly sinuated in front of the middle, anterior extremity obliquely rounded, posterior obtuse: — seen from above, oblong cuneiform, greatest width behind the middle and about equalling $^2/_5$ of the length, anterior extremity more pointed than the posterior. Valves very unequal, the right one overlapping the left both anteriorly and posteriorly. Surface of shell finely dotted all over, and clothed at both extremities with delicate hairs. Caudal rami narrow and elongated, slightly curved, claws slender and very finely denticulated. Colour yellowish, clouded with green, ovarial tubes bright orange. Length of adult female reaching 1.80 mm.

Remarks. This form was formerly wrongly identified by the author with *Cypris stanleyana* of King, which is a very different species, even belonging to a different genus. After having had, through the kindness of Mr. Whitelegge, an opportunity of consulting the memoir of King, I find it to be most probably the form that he describes as *Cypris candonoides*.

As I have, in the above quoted paper, given a full description of the species, I do not regard it necessary to describe it anew, but give only the above abbreviated diagnosis and some new figures, in order to facilitate the comparison with the next, nearly-allied species.

Observations. The present form developed in immense abundance in some of my aquaria and continued to live during several successive seasons. In the adult state it would seem to have entirely lost its swimming power, being constantly found slowly creeping on the bottom

or along the walls of the aquarium in a similar manner to that of the species of *Candona*. Before reaching the adult state, it is, however, much more active, being often found to move rather quickly through the water. The specimens domesticated in my aquaria grew to a somewhat larger size than those raised from Australian mud, attaining a length of 1.80 mm., but otherwise exactly agreed with the latter. No male specimens were ever detected either among the New Zealand or the Australian specimens, and the species is therefore, without any doubt, exclusively parthenogenetical.

Occurrence. The species was raised from both of the 2 parcels of mud at first received, and its occurrence in New Zealand may thereby be stated to be as follows: 1) Lagoons in the neighbourhood of Dunedin, 2) Pond at Eyreton, North Canterbury district. The species also occurs in the neighbouring continent of Australia, being first detected by the Rev. R. L. King at Varroville, and subsequently collected by Mr. Whitelegge off Bourke Street, Sydney. The specimens formerly examined by the author, were raised from dried mud taken from the Gracemere Lagoon and the Crescent Lagoon, both occuring in the northern part of the continent. Finally, the same form has been raised by the author from dried mud collected at Knysna, Cape of Good Hope.

11. *Candonocypris assimilis*, G. O. Sars, n. sp,
(Pl. V, figs. 2a—c).

Specific Characters. Shell seen laterally of a rather regular oblong reniform shape, being of about same height anteriorly as posteriorly, dorsal margin slightly curved, ventral distinctly sinuated, both extremities evenly rounded, and nearly equal: — seen from above rather narrow, oblong cuneiform, anterior extremity more pointed than the posterior. Valves somewhat less unequal than in the preceding species, the right one only overlapping the left along the anterior extremity. Surface of shell smooth and polished, pilose only at both extremities. Caudal rami slightly tapering distally, and nearly straight; otherwise of much the same structure as in the preceding species. Colour more or less dark fuscous. Length of adult female 1.60 mm.

Remarks. The present new species is very nearly allied to the preceding one, but evidently distinct, differing in the more regular reniform shape of the shell, the less unequal valves, and the rather different colour.

Description of the female.

The length of fully adult specimens does not exceed 1.60 mm., and this species is accordingly of somewhat smaller size than the preceding one.

Seen from the side (fig. 2 a), the shell exhibits a rather regular, oblong reniform shape, the height being about the same anteriorly as posteriorly, and not attaining half the length. The dorsal margin is very slightly and evenly curved, whereas the ventral one exhibits a distinct sinus about in the middle. Both extremities are evenly rounded and nearly equal.

Seen from above (fig. 2 b) the shell appears rather narrow, and of an oblong cuneiform shape, with the greatest width somewhat exceeding $^1/_3$ of the length, and occurring behind the middle, the anterior extremity being narrower and more pointed than the posterior.

The valves, as in the preceding species, are unequal, but the inequality is not nearly so great as in that species, and only conspicuous in the anterior part, where the right valve overlaps the left by a projecting border defined from the inner duplicature by an elevated ridge. Posteriorly, on the other hand, no projecting border of the right valve is observable, when the shell is viewed from the left side (fig. 2 a).

The surface of the shell is quite smooth and polished, of a shining lustre, and carries, at each extremity, delicate hairs projecting beyond the edges. The muscular pits (lucid spots), as in the preceding species, are very conspicuous, and occur considerably in front of the middle of each valve. They are 7 in number, 2 of them being placed at some distance below, and somewhat in front of the others.

The eye is well developed and easily observable in the living animal by its shining lustre.

The several appendages nearly agree in their structure with those in the preceding species.

The caudal rami (fig. 2 c) are rather slender and somewhat attenuated distally, being nearly straight. The claws and setæ are of same shape as in *C. candonoides*.

The colour considerably differs from that in the said species, being much darker, fuscous, changing to olivaceous, especially along the back and the anterior extremity. Along the sides, behind the muscular pits, as in most other Cyprididæ, occurs a lighter, obliquely diagonal band, divided in the middle by a narrow dark stripe. Below the stripe the

cœcal appendages of the intestine lie imbedded between the lamellæ of the shell, and above it the ovarial tubes shine through the shell, containing eggs in course of development.

Observations. This form also developed in great abundance in some of my aquaria, and in one of them still lives, after a space of no less than 4 years has elapsed since the aquarium was arranged.

In habits it exactly agrees with the preceding species, being generally found on the bottom of the aquarium, and, at least in the adult state, being quite devoid of swimming power.

Occurrence. The species only developed from one of the 3 parcels of mud received, viz., that taken from Lagoons in the neighbourhood of Dunedin, and this is, accordingly, the only locality as yet known, where the species is stated to occur.

Gen.: ***Ilyodromus,*** G. O. Sars, n.

Syn.: Herpetocypris, G. O. Sars (part).

Generic Characters. Shell highly compressed and, seen laterally, oblong in form, with the dorsal edge straight in the middle, the ventral more or less sinuated. Valves generally not very unequal, the left one being in every case the larger, inner duplicatures very broad and shelf-like. Surface of shell in most of the species striated longitudinally. Setæ of the superior antennæ shorter than in the preceding genus, those of the inferior ones poorly developed, not reaching beyond the terminal claws. First pair of maxillæ of nearly same structure as in the genus *Caudonocypris*. Caudal rami, on the other hand, much coarser, and armed with 3 strong claws, increasing in length distally. Animal quite devoid of swimming power. Propagation exclusively partheno-genetical.

Remarks. I have felt justified in establishing this new genus, to include a number of species, which agree with each other in all essential characters, but in some points differ very markedly from the other known genera. Of these, the genus *Candonocypris* is undoubtedly that to which it bears the closest relationship. It differs, however, from this genus, in the more compressed shell, the left valve of which is the larger, whereas in the former genus the case is inverted. Moreover the setæ of the superior antennæ are much shorter, and the caudal rami rather different, being much coarser and having 3, instead of only 2 claws, the dorsal seta being here replaced with a claw of the very same appearance as the other 2.

No less than 5 different species of this genus have developed in my aquaria, and will be described below. A 6th Australian species was described by the author at an earlier date as *Herpetocypris viridula* (Brady). Of the European Cyprididæ the *Herpetocypris olivacea* Brady & Norman undoubtedly belongs to the same genus.

The species of this genus are quite devoid of swimming power, but move about in the loose bottom deposit with great dexterity by the aid of their antennæ and powerfully developed tail.

12. *Ilyodromus stanleyanus*, (King).

(Pl. V, figs. 3 a—e).

Candona stanleyana, King, l. c., p. 66, Pl. X. H.

Specific Characters. Shell highly compressed, and but sparingly pilose at both extremities: — seen from the side, oblong reniform, nearly of equal height anteriorly and posteriorly, dorsal margin quite straight in the middle, ventral very slightly sinuate, both extremities rounded: — seen from above, very narrow, side-contours subparallel, both extremities pointed. Valves but slightly unequal, though the left one rather overlaps the right both anteriorly and posteriorly; inner duplicatures at both extremities very broad, shelf-like, and passing into each other ventrally. Surface of shell very distinctly sculptured with elevated longitudinal lines. Caudal rami rather strong, nearly of equal breadth throughout, claws of moderate length. Colour dark green. Length of adult female 1.65 mm.

Remarks. I cannot doubt that this is the true *Candona stanleyana* of King. The form described by Brady as *Cypris stanleyana* is hardly the same form, but seems more properly to be an immature specimen of some other species, perhaps not even belonging to the present genus. The species here treated of may be distinguished by its extremely compressed and very distinctly striated shell, the form of which is rather regularly reniform; moreover by its uniform, dark green colour.

Description of the female.

The length of fully adult specimens measures 1.65 mm.

The shell is extremely compressed, more so, indeed, than in any of the other species, the greatest width not even exceeding $^2/_3$ of the height.

Seen from the side (fig. 3 a), it exhibits a rather regular oblong reniform shape, being of about same height anteriorly as posteriorly. The dorsal margin is quite straight and horizontal in the middle,

declining somewhat more abruptly to the posterior than to the anterior extremity. The ventral margin appears likewise nearly straight, though exhibiting in the middle a very slight concavity. Both extremities are rounded and nearly equal.

Seen from above (fig. 3 b), the shell appears extremely narrow, its greatest width not even attaining $^1/_3$ of the length. The side-contours are nearly straight and subparallel in the middle, and both extremities pointed, the anterior being, however, somewhat narrower than the posterior.

The valves are not very unequal, though, on a closer examination, the left one is found to be the larger, as is the case with all the species belonging to this genus. When the shell is viewed from the right side (fig. 3 a), the edge of the left valve is seen to project beyond that of the right both along the anterior and posterior extremity, as also in the middle of the ventral side; but the projecting border is everywhere very narrow. Inside, each valve forms (see fig. 3 c) both anteriorly and posteriorly a very broad, shelf-like duplicature, both combined nearly occupying half the length of the shell, and these duplicatures are found to pass uninterruptedly into each other on the ventral side, their inner edge being also easily traced exteriorly through the shell as a curved line (see fig. 3 a).

The surface of the shell is sculptured throughout with very distinct, elevated lines running longitudinally, and terminating just within the anterior and posterior edges. In some few places they are found to anastomose, but most generally they run parallel to each other through the whole extent of the shell. These lines are fairly conspicuous, even with a comparatively low magnifier, and are very different from the extremely delicate, impressed striæ often found in immature specimens of species, whose shell in the adult state becomes quite smooth. Between the lines the usual pits are traced, being rather small and distant. At both extremities the shell is clothed with a number of rather short and delicate hairs.

In fig. 3 c, the animal, with its several appendages, is represented, after the left valve has been removed. A detailed description of these appendages, I do not consider necessary, as, on the whole, they nearly agree in their structure with those in the preceding genus.

It will be seen from the figure that the setæ of the superior antennæ are considerably shorter than in that genus, and also those affixed to the antepenultimate joint of the inferior antennæ are very poorly developed, being quite short and not ciliated.

The 1st pair of maxillæ (fig. 3 d) exhibit a similar characteristic form of the palp and the masticatory lobes to that in the genus *Candonocypris.*

The caudal rami (fig. 3 e) are, on the other hand, rather different, being much more strongly built and nearly of equal breadth throughout. At the somewhat obliquely truncated tip, they carry each 3 strong claws increasing successively in length distally, the outmost being more than twice as long as the 3rd. Just in front of the former, a very small bristle is seen to issue; but no dorsal bristle exists, it being replaced by the smallest of the 3 claws.

The colour is a rather uniform dark green, being only interrupted on the sides of the shell, behind the muscular pits, by the translucent ovarial tubes and intestinal cœca, which exhibit a yellowish orange hue.

Observations. This form developed in 2 of my aquaria, and in one of them multiplied rather plentifully, reappearing also the next season.

The animal is not easy to detect in the aquarium, being generally deeply buried in the loose bottom deposit, through which it moves with great dexterity and rather rapidly. This movement, effected by the aid of the antennæ, the 1st pair of legs and the caudal rami, may be easily watched in those specimens which happen to be close to the walls of the aquarium, and indeed conveys the impression of a rapid run through the mud; hence the generic name *Ilyodromus.* I have never seen the animal make the slightest attempt to swim.

Occurrence. The species was only raised from one of the 3 parcels of mud received, viz., that taken from lagoons in the neighbourhood of Dunedin, and this is accordingly the only place in New Zealand where this form has hitherto been stated to occur. The species was first detected by the Rev. R. L. King, who found it in ponds on the top of the sandstone rocks, Sydney.

13. *Ilyodromus varrovillius,* (King).

(Pl. VI, figs. 1 a—c).

Cypris varrovillia, King, l. c., p. 66, Pl. X. D.

Specific Characters. Shell, seen laterally, very narrow, oblong reniform, nearly of equal height anteriorly and posteriorly, dorsal margin straight in the middle, ventral deeply sinuated, anterior extremity more obtuse than the posterior: — seen from above narrow oblong, anterior

extremity more pointed than the posterior. Valves but slightly unequal, though the left one projects a little beyond the right at both extremities; inner duplicatures very broad. Surface of shell, as in the preceding species, sculptured with well-marked, elevated, longitudinal lines, and clothed at each extremity with delicate hairs. Caudal rami rather strong and nearly of same appearance as in *I. stanleyanus*. Colour deep green, with a diagonal orange-coloured band (the translucent ovarial tubes and intestinal cœca) behind the middle. Length of adult female 1.65 mm.

Remarks. The above characterized form is unquestionably that recorded by King as *Cypris varrovillia*. It is nearly allied to the preceding one, though easily distinguishable by the much narrower form of the shell and its deep ventral sinus.

Description of the female.

The length of adult specimens measures 1.65 mm., and this species accordingly attains about the same size as the preceding one.

The shell is rather compressed, though scarcely to such a degree as in *I. stanleyanus*, and is clothed at both extremities with delicate hairs, somewhat longer than in that species.

When seen laterally (fig. 1 a), the shell exhibits a very narrow, oblong reniform shape, the greatest height scarcely exceeding $^2/_5$ of the length. The dorsal margin is quite straight in the middle, whereas the ventral one is deeply sinuated, the sinus occurring somewhat in front of the middle. The posterior extremity is obliquely rounded and somewhat narrower than the anterior, which is obtusely blunted.

Seen from above (fig. 1 b) the shell appears of a narrow oblong form, with the greatest width behind the middle and the anterior extremity more pointed than the posterior.

The valves, as in the preceding species, are but slightly unequal, though also in this species, the left one is found to be the larger, overlapping the right somewhat at both extremities, as also along the ventral side. The inner duplicatures are very broad, and their defining edge may be easily traced exteriorly through the shell.

The surface of the shell is sculptured in the very same manner as in *I. stanleyanus*, exhibiting everywhere well-marked, elevated lines running longitudinally from the anterior to the posterior extremity, and terminating at a short distance within the edge.

The several appendages are of a structure very similar to that in *I. stanleyanus*.

The caudal rami (fig. 1 c) are perhaps still more coarsely built, and have their outer part somewhat dilated, with the 3 claws well developed.

The colour is a rather uniform deep green, being only interrupted on the sides of the posterior part, where the ovarial tubes and the cœca of the intestine shine through the shell with a more or less vivid orange hue.

Observations. Of this form also, several specimens developed in my aquaria, and in one of them the species was watched during 2 successive seasons. In habits, it exactly agrees with *I. stanleyanus*, being only found at the bottom, among the loose muddy deposit, through which it burrows with great agility.

Occurrence. The species was raised from 2 of the 3 parcels of mud received, and its occurrence in New Zealand is thereby proved to be as follows: 1) Lagoons in the neighbourhood of Dunedin, 2) Ditches at Kaitaia in the North Island. The species was first detected by the Rev. R. L. King, who found it at Varroville, near Sydney.

14. *Ilyodromus smaragdinus*, G. O. Sars, n. sp.

(Pl. VI, figs. 2 a—c).

Specific Characters. Shell seen laterally oval reniform, height nearly half the length, dorsal margin perfectly straight and angular both in front and behind, ventral distinctly sinuate, anterior extremity obliquely rounded, posterior broader and more obtuse: — seen from above oblong, more pointed anteriorly than posteriorly. Valves but very slightly unequal, though the left one, as usual, is found to be the larger, inner duplicatures very broad, especially at the anterior extremity. Surface of shell perfectly smooth, without any trace of the usual striation, and slightly pilose at both extremities. Caudal rami somewhat less strong than in the 2 preceding species, but otherwise of a very similar structure. Colour a vivid emerald-green clouded with darker shades. Length of adult female 1.50 mm.

Remarks. This new species is at once distinguished from the 2 preceding ones by the absolute want of any striation of the shell, and by the somewhat angular and less narrow form of the latter, as also by its beautiful emerald-green colour. I have not been able to identify it with any of the species described by King.

Description of the female.

Fully adult specimens do not exceed a length of 1.50 mm., and this species is accordingly of somewhat smaller size than the 2 preceding ones.

Seen from the side (fig. 2 a), the shell exhibits a somewhat angular, oval reniform shape, the greatest height equalling almost half the length. The dorsal margin is perfectly straight and slightly ascending posteriorly, joining both the anterior and posterior edges by a distinct, though obtuse angle. The ventral margin is distinctly and evenly sinuated in the middle. The anterior extremity appears obliquely rounded and somewhat narrower than the posterior, which is rather broad and blunted at the end.

Seen from above (fig. 2 b), the shell appears somewhat less compressed than in the 2 preceding species, being of a regular oblong ovate form, the greatest width somewhat exceeding $^1/_3$ of the length. The anterior extremity is, as usual, more pointed than the posterior.

The valves at first sight appear nearly equal, but, on a closer examination, in this species also, the left one is found to be a little larger than the right, slightly overlapping it at both extremities, as also ventrally. The inner duplicatures are very broad, especially the anterior one, both passing into each other on the ventral side.

The surface of the shell does not exhibit the slightest trace of the elevated longitudinal lines found in the 2 preceding species, but appears perfectly smooth, with only the usual small pits. At both extremities, it is clothed with delicate hairs projecting beyond the edges of the shell.

There is no essential peculiarity found in the structure of any of the appendages, which are constructed upon the very same type as in the 2 preceding species.

The caudal rami (fig. 2 c) appear somewhat less strong than in those species, and are slightly attenuated, but otherwise exhibit the structure characteristic of the genus.

The colour is a magnificent emerald-green, clouded with irregular darker shades. The ovarial tubes and intestinal cœca shine through the shell with a reddish orange hue.

Observations. This form only developed in one of my aquaria, and did not reappear in any of the succeeding seasons. In habits it agreed with the other species, and moved in a similar manner among the loose muddy deposit of the bottom.

Occurrence. The parcel of mud from which this species was raised was that collected from lagoons in the neighbourhood of Dunedin, the only locality, where this form as yet has been stated to occur.

15. *Ilyodromus substriatus*, G. O. Sars, n. sp.

(Pl. VI, figs. 3a—c).

Specific Characters. Shell seen from the side subreniform, higher posteriorly than anteriorly, dorsal margin very slightly curved, and forming in front, just above the eye, an obtuse angle, ventral margin distinctly sinuated, anterior extremity narrowly rounded, posterior obtuse: — seen from above oblong ovate, tapering gradually in front, anterior extremity more pointed than the posterior. Valves rather unequal, the left being much the larger, inner duplicatures of the anterior extremity much broader than those of the posterior. Surface of shell sculptured with rather delicate, and not very conspicuous longitudinal lines, and densely pilose at both extremities. Caudal rami well developed, and of the usual structure. Colour light yellowish green, darker along the back and round the edges. Length of adult female 1.40 mm.

Remarks. This new species looks very like the form described by the author at an earlier date as *Herpetocypris viridula* (Brady), and may easily be confounded with it. On a closer examination, however, it is readily distinguished by the different structure of the shell, and its somewhat paler colour.

Description of the female.

The length of fully adult specimens does not exceed 1.40 mm., and this species is accordingly rather inferior in size to the 3 preceding ones, though somewhat larger than *I. viridulus*.

When seen from the side (fig. 3 a), the shell exhibits a somewhat reniform shape, with the greatest height not nearly attaining half the length, and occurring behind the middle. The dorsal margin is very slightly convex, and forms in front, just above the eye, an obtuse angle; posteriorly it slopes rather abruptly to the hind extremity. The ventral margin exhibits a well-marked sinus at about the middle. The anterior extremity is narrowly rounded and considerably lower than the posterior, which is rather broad and blunted.

Seen from above (fig. 3 b), the shell appears somewhat compressed, being oblong ovate in form, with the greatest width but little exceeding

1/3 of the length. It gradually tapers in front, and has the anterior extremity much more pointed than the posterior.

The valves are rather densely pilose at both extremities, and of comparatively firm consistency, their edges being highly chitinised, with distinct radiating stripes. They are rather unequal, the left one being much the larger, and overlapping the right along the whole ventral side, as also at both extremities. The inner duplicatures are much broader anteriorly than posteriorly, passing into each other along the ventral side.

The surface of the shell is sculptured with very delicate lines running longitudinally. These lines are found in all the specimens examined and are easily observable, though not nearly so sharply marked as in *I. stanleyanus* and *varrovillius*. In the nearly-allied Australian species, *I. viridulus*, on the other hand, no trace of such a striation is ever found, the shell being, in this species, invariably quite smooth.

As in the latter species the eye is very conspicuous in the living animal, by its comparatively large size and the brillant iridescent lustre of its outer faces.

The several appendages exhibit the structure characteristic of the genus.

The caudal rami (fig. 3 c) are well developed, and nearly of uniform breadth throughout. The 3 claws are comparatively short, but rather strong.

The colour is a light yellowish green, clouded with darker green on the back and round the edges. On the sides of the shell, behind the very conspicuous muscular pits, the ovarial tubes and intestinal cœca shine through the shell with a vivid orange hue.

Observations. This species also only developed in one of my aquaria, but in this multiplied rather plentifully. It did not, however, reappear the succeeding seasons. In habits, it agrees with the other species, being a true bottom-form.

Occurrence. The species was raised from the same parcel of mud as *I. smaragdinus*, and accordingly its occurrence, as yet known, is restricted to the environs of Dunedin.

16. *Ilyodromus obtusus*, G. O. Sars, n. sp.

(Pl. VI, figs. 4 a—d).

Specific Characters. Shell somewhat less compressed than in the preceding species, and, seen laterally, of a rather regular reniform shape, being of about the same height anteriorly as posteriorly, dorsal margin

quite straight in the middle, or even somewhat concave, ventral deeply sinuated, both extremities obtusely rounded and nearly equal. Valves but very slightly unequal, though in this species also, the left one is found to be the larger, inner duplicatures rather broad, especially at the anterior extremity. Surface of shell sculptured with very distinct, elevated longitudinal lines, and slightly pilose at both extremities. Caudal rami of moderate size, slightly dilated distally, claws as in the other species. Colour dark green. Length of adult female 1.40 mm.

Remarks. The present new species is somewhat allied to the preceding one, though easily distinguishable by the rather different form of the shell, its very distinct striation and dark colour.

Description of the female.

The length of adult specimens measures 1.40 mm., and this species is accordingly of about same size as the preceding one.

The shell is comparatively more tumid than in that species, and also of less firm consistency.

Seen from the side (fig. 4 a), it exhibits a rather regular oblong reniform shape, being somewhat instricted in the middle and of about equal height anteriorly and posteriorly. The dorsal margin is perfectly straight and horizontal, sometimes even a little concave in the middle, and joins the anterior and posterior edges by a strong curvature. The ventral margin exhibits in the middle a very distinct and rather deep sinus. Both extremities appear obtusely rounded and nearly equal, though the posterior one is somewhat more blunted than the anterior.

Seen from above (fig. 4 b), the shell exhibits an oblong oval form, with the side-contours nearly straight and parallel in the middle, and the greatest width considerably exceeding $^1/_3$ of the length. Both extremities appear pointed, the anterior one, however, more so than the posterior.

The valves are but very slightly unequal, thought he left one is found, on a closer examination, to be somewhat larger than the right, slightly overlapping it at both extremities, as also ventrally. The inner duplicatures are rather broad, especially those of the anterior extremities, and their defining edge is easily traced through the shell.

The surface of the shell is everywhere sculptured with very distinct elevated lines running longitudinally from the one extremity to the other, and, both anteriorly and posteriorly, is clothed with delicate hairs.

The several appendages do not differ in any essential manner from those in the other species. Fig. 4 c represents the terminal part of the 1st maxilla, and fig. 4 d one of the caudal rami. The latter are rather stout and slightly dilated in their outer part, with all 3 claws well-developed.

The colour is a very dark and rather uniform green, only interrupted by the translucent ovarial tubes and intestinal cœca, which together produce a diagonal orange patch on each side of the posterior part of the shell.

Observations. This form was found in the same aquarium as the preceding one, and its presence was proved by taking up, by the aid of a dipping tube, small quantities of the bottom deposit, and placing them, together with some water, in shallow watch-glasses, when the specimens soon made their appearance creeping out from the mud. Like the other species, it is a true bottom-form, being quite devoid of swimming power, but burrowing with great dexterity through the loose mud.

Occurrence. The species was raised from the same parcel of mud as the 2 preceding ones, and accordingly its occurrence, as yet known, is restricted to the environs of Dunedin.

Order: **Copepoda.**

Tribe: **Calanoidea.**

Fam.: *Diaptomidæ.*

Gen.: ***Boeckella,*** Guerne & Richard.

Syn.: Boeckia, Thomson, not Malm.

Generic Characters. Body of a form similar to that in the genus *Diaptomus*, the anterior division being divided into 6 distinctly defined segments, the 1st of which is much the largest, and carries the antennæ and oral parts, whereas the 5 posterior segments are each provided with a pair of biramous legs; last segment in female greatly produced at the end on each side. Tail in female triarticulate, in male 5-articulate. Caudal lamellæ short, each with 5 plumose setæ. Antennæ and oral parts nearly as in the genus Diaptomus. Legs in female all natatory, and of subequal structure, both rami being distinctly 3-articulate; last pair with the 2nd joint of the outer ramus produced inside. Last pair

of legs in male very powerful, each leg being prehensile and terminating in a long, movable claw, the inner ramus in both rudimentary.

Remarks. This genus was established by Mr. Thomson, to include the New Zealand form described below; but, as the generic name he proposed, *Boeckia*, was already appropriated in Zoology, Messrs. Guerne and Richard changed it to *Boeckella*. The genus is nearly allied to *Diaptomus*, yet differs very markedly in the structure of the last pair of legs in both sexes. Besides the New Zealand species, Messrs. Guerne and Richard also refer the South American form, *Diaptomus brasiliensis* Lubbock, to this genus.

17. *Boeckella triarticulata* (Thomson).
(Pl. VII & VIII).

Boeckia triarticulata, Thomson, On New Zealand Copepoda: Proceed. N. Zeal. Institute, Vol. XV, p. 95, Pl. VI, figs. 1—9.

Boeckella triarticulata, Guerne & Richard, Revision des Calanides d'eau douce, p. 103.

Specific Characters. Anterior division of body in female oblong oval, slightly attenuated in front, 1st segment about equalling in length the 4 succeeding segments combined, front without any appendages; last segment produced on each side to a very strong mucroniform projection pointing obliquely backwards, and having inside the latter another much shorter lobe slightly hamate at the tip. Same part in male comparatively narrower and without the projecting lobes of last segment. Tail, including the caudal lamellæ, about half the length of the anterior division, 1st segment in female very large and tumid in its anterior part, in male scarcely larger than the succeeding segments. Caudal lamellæ somewhat exceeding in length the last caudal segment and very slightly expanded distally, terminal setæ not very long but densely plumose. Eye small, but distinct. Anterior antennæ about equalling in length the body, without the caudal lamellæ, and composed of 21 articulations. Right prehensile antenna of male without any spines or processes on its terminal part. Last pair of legs in female having the outer ramus only armed with spines, inner projection of 2nd joint very strong, mucroniform, and coarsely denticulated. Those in male very powerful, right leg with the outer ramus biarticulate and the inner long, cylindric; left leg having at the end of the basal part, inside, a lamellar expansion serrate at the edge, outer ramus uniarticulate, with the terminal claw very slender and carrying a secondary spine at the base

outside, inner ramus very small. Colour of female transparent bluish, with a reddish brown tinge on the middle; that of male more pronouncedly red. Length of adult female 2.10 mm., of male 1.67 mm.

Remarks. This form was detected by Mr. G. Thomson and briefly described in the above quoted paper as *Boeckia triarticulata*. This description, translated into French, was subsequently reproduced in the work of Messrs. Guerne & Richard on the fresh water Calanidæ; but a more complete description and illustration has not yet been given, either of this form or of the allied Brazilian species. I have therefore thought it right to give below a full description of the New Zealand species, accompanied both by habitus and detail figures.

Description of the female.

The length of fully adult specimens, excluding the caudal setæ, measures 2.10 mm.

In the general form of the body (see Pl. VII, fig. 1) it looks very like a *Diaptomus*. As in this genus, the two chief divisions of the body are very sharply marked off from each other. The anterior division, comprising the cephalon and metasome, is of an oblong oval, or rather subcylindrical form, and is divided into 6 sharply defined segments, the anterior of which is much the largest and about equals in length the 4 succeeding ones combined. To the ventral face of this segment are attached the 2 pairs of antennæ and the several oral parts, whereas each of the succeeding 5 segments carries a pair of biramous natatory legs. As seen from above (fig. 1), the anterior segment gradually tapers in front, and terminates in a somewhat blunted frontal part. It does not exhibit any trace of the transverse suture occurring in the species of *Diaptomus*, and marking off an anterior cephalic segment. The front is slightly curved downwards, but is without any terminal tentacular appendages. The 4 middle segments are rather short and but little different, though perhaps slightly diminishing in size posteriorly. The last segment, on the other hand, is highly distinguished by the peculiar development of its lateral parts (see also fig. 3). It is deeply emarginated behind in the middle, and projects on either side into 2 lobes, the outer of which is very large, mucroniform, and pointing obliquely behind and outwards. The inner lobe is considerably smaller and terminates in a somewhat hooked point. These latter lobes are slightly unequal, the right lobe being the larger.

The tail, or urosome (see figs. 1 and 3), is about half as long as the anterior division and much narrower, being very movably connected with the same. It is composed of only 3 segments, the 1st of which, however, is rather large, exceeding in length the other 2 combined, and has its anterior part very tumid and somewhat assymetrical in form. Below, this segment forms an obtuse prominence containing the genital orifice, and to this protuberance the ovisac becomes affixed. The last segment has dorsally a lip-shaped transverse border covering over the anal orifice, and to its end the caudal lamellæ, or the so-called furca, are attached. The latter are not very much elongated, scarcely attaining $^1/_3$ of the length of the tail. They are finely ciliated inside, and slightly dilated distally, with the extremity obtusely rounded. The caudal setæ on each lamella are 5 in number, 4 of which issue from the tip, the 5th from a ledge in the outer edge, at some distance from the tip. They are all rather strong and subequal, though not much elongated, and are very densely plumose. Moreover, each lamella carries dorsally, at the inner corner, a short non-ciliated bristle.

The eye is very small but distinctly observable, occurring somewhat ventrally, between the insertion of the 1st pair of antennæ. It is of a structure quite similar to that in the genus *Diaptomus*, with the pigment of a dark red colour.

The 1st pair of antennæ (see fig. 1) reach, when reflexed, almost to the end of the caudal lamellæ. In the living animal, they are extended laterally, pointing somewhat obliquely backwards. They are very slender, tapering gradually distally, and are composed of 25 well-defined joints carrying anteriorly delicate bristles. The last joint (see fig. 2) is rather small and provided at the tip with a fascicle of unequal bristles. Each of the 3 preceding joints has, in addition to the anterior bristles, a single one at the end posteriorly.

Each of the 2nd pair of antennæ (Pl. VIII, fig. 1) consists of a 2-jointed basal part and 2 differently shaped rami. The inner ramus, which, as it were, forms the immediate continuation of the basal part, is biarticulate, with the last joint the shorter and somewhat compressed, carrying 13 plumose setæ, 6 of which issue from the tip, the other 7 from a ledge on the anterior edge. The outer ramus is a little longer than the inner and very flexible, of a narrow cylindric form, and divided into 7 joints, the last of which is nearly as long as all the others combined. Of these, the 2nd is the largest, the other 5 very short. From the tip of this ramus issue 3 very much elongated plumose setæ, and along

the inner edge occurs a row of 8 considerably shorter setæ, likewise densely plumose.

The labrum forms, as in the genus *Diaptomus*, a flap-shaped prominence densely hairy at the edge, and covering the oral orifice.

The mandibles (fig. 2) are rather strong, with the masticatory part expanded in a securiform shape and divided into several sharp teeth, the outmost of which is much the largest. The mandibular palp is well developed, being about as long as the mandible itself. It is composed of a somewhat flattened biarticulate basal part and 2 short rami. The 1st joint of the basal part is very small, whereas the 2nd is rather large and provided inside with 4 plumose setæ. The inner ramus, which forms the immediate continuation of the basal part, is biarticulate, the 1st joint being rather short and forming inside a projecting lobe clothed with 4 plumose setæ; from the tip of the last joint 6 similar setæ issue. The outer ramus is articulated about in the middle of the basal part outside. It is composed of 5 short joints, each carrying at the end inside a very strong, exteriorly curving, plumose seta, the setæ successively diminishing in size distally.

The maxillæ (fig. 3) are sublamellar, and consist of the true masticatory part, to the outer side of which is attached a rather complicated palp or exognath divided into several setiferous lobes. The masticatory part projects inside as a triangular lobe armed with numerous strong, partly denticulated spines, arranged in several rows. The palp has outside, close to the base, a short and broad lamella carrying a row of 8 particularly strong and densely plumose setæ extending straight outwards. Its distal part is divided inside into 3 densely setiferous lobes, and carries at the tip likewise a number of ciliated setæ. Outside is attached a small lamella fringed with about 10 ciliated setæ; this lamella would seem to answer the outer ramus of the mandibular palp.

The anterior maxillipeds (fig. 4) form each a comparatively short and thick stem divided into 4 unequal segments, the 1st of which is much the largest, whereas the last one is extremily small and tuberculiform. Each of the 3 proximal segments projects anteriorly into 2 narrow lobes carrying at the tip 2 or 3 strong, anteriorly curving setæ, sparsely ciliated on the edges, and from the last joint likewise issue 3 or 4 similar, but shorter setæ.

The posterior maxillipeds (fig. 5), which issue immediately behind the anterior, are much more slender, and each composed of a basal and a terminal part, forming together a geniculate bend. The basal part is divided into 2 well defined and somewhat compressed segments carrying

anteriorly several short, plumose setæ. Moreover, the last segment has close to the end an apparently mobile, small lobe terminating in 2 setæ. The terminal part is generally curved anteriorly almost at a right angle to the basal, but, being very mobile, admits also of being extended in the same axis as the basal part. It is very slender, cylindric, and composed of 5 joints carrying inside strong, curved setæ, which on the outer joints assume an almost claw-like character, being finely denticulated on the one edge only.

The legs are 10 in number, corresponding to the 5 segments of the anterior division of the body succeeding the large cephalic segment. They are all biramous and natatory, being constructed upon the same type, though exhibiting some minor differences in their details (comp. figs. 6—9), The basal part is composed of 2 flattened segments, the 1st of which, except in the last pair, carries at the end inside a densely plumose seta. Both rami are 3-articulate and of unequal size, the outer one being the larger and carrying outside strong spines.

The 1st pair of legs (fig. 6) is the smallest, and the spines of the outer ramus are less strong than in the other pairs. Their number, as in the succeeding pairs, is 5 in all, the first 2 joints carrying each a single spine, whereas the last joint has 3 spines, 2 on the outer edge and one at the tip, the latter being much the largest. Inside, this ramus has 6 densely ciliated, natatory setæ, one on each of the first 2 joints, and 4 on the last, the outmost seta issuing from the tip of the ramus close inside the apical spine. The inner ramus is finely ciliated outside and carries 8 natatory setæ, one on each of the first 2 joints inside, and 6 on the last joint, 2 of which issue from the tip, one from the outer edge, and the remaining 3 from the inner edge. In the genus *Diaptomus* this ramus is only composed of 2 joints.

The 2nd pair of legs (fig. 7) is considerably larger than the 1st, and has the spines of the outer ramus much stronger. The apical spine especially is very much elongated and somewhat knife-shaped, with the outer edge sharp and finely denticulate. The natatory setæ are more numerous, the last joint of the outer ramus having 5, that of the inner, 8 setæ, 2 of which issue from the outer edge. Moreover, the 2nd joint of this latter ramus carries inside 2 setæ, instead of a single seta

The 3rd pair of legs exactly agrees in its structure with the 2nd.

The 4th pair of legs (fig. 8) are likewise of much the same appearance, and only differ in the circumstance of the last joint of the inner ramus having but 3 setæ inside, whereas in the 2 preceding pairs there are 4 such setæ.

The 5th pair of legs (fig. 9), on the other hand, distinguish themselves more markedly from the other pairs, though not nearly to such a degree as in the genus *Diaptomus*. In that genus this pair is very different from the rest, whereas in the present genus, they are, on the whole, constructed upon the same type and, like the other pairs, are natatory, being composed of the same essential parts. The basal part, however, appears comparatively broader, its 1st segment bulging out exteriorly, and having no seta inside. The outer ramus is rather strongly built, and quite devoid of natatory setæ. Its 1st joint is quite smooth inside, whereas it carries outside, as in the other pairs, a strong spine. The 2nd joint has likewise outside the usual spine, and is produced inside to a very strong spiniform projection coarsely denticulated on both edges. The last joint is comparatively small, scarcely exceeding in length the 2nd, and much narrower. It carries 7 spines, 2 on the outer edge, 3 on the inner, and 2 on the tip, the outer apical spine being much the larger, though not, as in the 3 preceding pairs, denticulate at the edge. The inner ramus is much narrower than the outer, and scarcely exceeds in length the 2 first joints of this ramus combined. In structure, it agrees with that in the other pairs, except that the natatory setæ are comparatively smaller and also less numerous, being in all only 8, one on each of the first 2 joints and 6 on the last one; of the latter, 2 issue from the outer edge, 2 from the inner, and 2 from the tip.

Of the inner organs, the intestine is easily traced through the semipellucid integuments by its yellowish contents. It is (see Pl. VII, fig. 1, comp. also fig. 4) rather wide in front, but gradually tapers posteriorly, and in the tail forms a very narrow channel debouching on the dorsal face of the last segment. The ovaries are very conspicuous by their dark brown colour, forming 2 twisted tubes extending through the middle part of the anterior division of the body, and being contiguous anteriorly. The heart is likewise easily observable in the living animal by its rapid pulsations. It has the form of a small bag, lying dorsally at the limit between the 2nd and 3rd segments.

The ovisac (not represented in the figure) is of a similar appearance as in the species of the genus *Diaptomus*, forming a broad flattened bag attached to the genital protuberance of the 1st caudal segment, and containing numerous dark brown eggs.

The body is semipellucid, of a bluish colour, more or less distinctly tinged in the middle part by reddish brown. The 1st pair of antennæ are light bluish at the base, but become reddish orange in their outer

part. The caudal setæ are coloured in the inverted manner, being orange at the base and bluish in their outer part. The genital protuberance of the 1st caudal segment is of a deep reddish colour.

Description of the male.

Fully adult male specimens do not exceed a length of 1.67 mm., and are accordingly rather inferior in size to the females.

The anterior division of the body (see Pl. VII, fig. 4) appears comparatively narrower than in the female, and of a more regular oblong oval form, tapering somewhat both posteriorly and anteriorly. The last segment (see also fig. 8) is quite simple, with the lateral parts not produced to any such projecting lobes, as in the female.

The tail (figs. 4 & 8) is very slender and narrow cylindric in form, being composed of 5 segments, the 1st of which does not exceed the others in length. The caudal lamellæ exhibit the very same structure as in the female.

The 1st pair of antennæ, as in the other *Diaptomidæ*, are unequally developed, the right antenna (fig. 5) being modified to a grasping organ, assisting the last pair of legs in getting hold of the female during copulation. The 5 outer joints of this antenna form together a movable terminal part, which admits of being doubled upon the adjacent part, which latter is strongly tumefied, and contains a very conspicuous muscular band moving the former. This tumefied part of the antenna comprises 7 joints, and, like some of the preceding joints, is armed anteriorly with slender spines, in addition to the bristles. The terminal part, on the other hand, does not exhibit any trace of spines or projections.

The 2nd pair of antennæ, the oral parts, and the 4 anterior pairs of legs are built in exactly the same manner as in the female.

The last pair of legs (fig. 6), on the other hand, are very different, being transformed to strong grasping organs. They differ very markedly from the same legs in the males of the genus *Diaptomus*, in being far less unequal, both legs being of nearly same size, and terminating each with a long curved claw. On a closer examination, however, some well marked differences are found to exist between the two.

The right leg has the outer ramus composed of 2 distinctly defined joints, the 1st of which is rather short and of a triangular form, with the outer corner somewhat produced and carrying a strong spine. The 2nd joint is very large and slightly curved, carrying at the end outside a long and straight spine. The terminal claw about equals the ramus

in length, and is very movably articulated to the same, being moved by a strong muscle, the radiating fibres of which are seen in the interior of the 2nd joint. It is somewhat compressed and rather strongly curved in its outer part, being generally bent inwards. The inner ramus of this leg forms a non-articulate, subcylindrical appendage, reaching about to the end of the ramus and terminating in a short point.

The left leg has the last segment of the basal part expanded inside to a thin triangular lamella denticulated at the edge (fig. 7). The inner ramus is much smaller than on the right leg, and of a narrow cylindric form, without any terminal point. The outer ramus is only composed of a single rather large joint of an oblong oval form, and armed at the tip outside with a strong spine. The terminal claw is very much elongated and slender, exceeding in length the whole leg. It is moreover somewhat flexuous and carries near its base, outside, a slender spine. This claw is generally found to be less strongly incurved than that of the right leg, though being, as the latter, movably articulated to the ramus.

Of the inner organs, the testicule is faintly traced (see fig. 4) through the integuments, as an opaque whitish mass lying above the intestine at the limit between the 1st and 2nd segments of the anterior division, and in one of the efferent ducts may be often seen a peculiar, narrow, flask-shaped body. This is the spermatophore, to be fastened during copulation by the aid of one of the last pair of legs to the genital orifice of the female.

The colour of the body is generally more pronouncedly red than in the female, though also exhibiting in some places a faint bluish tinge.

Observations. Of this interesting Copepod some specimens, males and females, were raised in one of my aquaria and continued to live during the whole summer. At the close of the season the females became loaded with their ovisacs; but the encosed ova did not develop to a 2nd generation, nor were any specimens observed during the next season.

In habits, as in external appearance, this form very closely resembles the species of the genus *Diaptomus*, and I therefore at first believed it to be a member of this genus. It is a very active animal, moving through the water with considerable speed, so as to be only with great difficulty caught by the aid of a dipping tube. Often, however, it is found for some time keeping its body suspended nearly in the very same place, and apparently quite immobile. But, on a closer examination, it is easily seen that this apparently immobile attitude

of the animal is in reality effected by very rapid, almost vibrating movements of the 2nd pair of antennæ. When disturbed, it starts away very abruptly so as hardly to be got sight of. This abrupt and extremely rapid movement is effected by a powerful stroke of the natatory legs combined with a sudden bend of the tail. In every case the animal is found to maintain an almost vertical attitude, the head upwards and the 1st pair of antennæ extended laterally, these appendages serving apparently as a sort of balancing apparatus.

Occurrence. The parcel of mud from which this form was raised, was taken from a pond at Eyreton, North Canterbury district. It was from the very same pond that the specimens examined by Mr. Thomson were derived. The species also occurs in the neighbouring continent of Australia, some well-marked specimens being found among a number of Entomostraca kindly sent me by Mr. Whitelegge, and collected in the neighbourhood of Sydney. It is therefore very probable that the species has already been observed by the Rev. R. L. King, and regarded by him as a *Diaptomus*. Of this genus, he enumerates 4 species, viz, *D. pollux*, *uxorius*, *Maria*, and *Cookii;* but as neither description, nor any figures are given, it is impossible at present to identify any of the species.

Explanation of the Plates.

Pl. I.

Daphnia Thomsoni, G. O. Sars.

Fig. 1. Adult ovigerous female, dorsal view (rami of the antennæ omitted). × 25.
— 2. Same, viewed from left side.
— 3. Inferior extremity of head, with the antennulæ, more strongly magnified.
— 4. Terminal part of tail, lateral view.
— 5. Ephippium, viewed from left side.
— 6. Adult male, lateral view. × 34.
— 7. Frontal part of head of same, more highly magnified.
— 8. Terminal part of tail, lateral view.

Pl. II.

Simocephalus obtusatus, (Thomson).

Fig. 1. Adult ovigerous female, viewed from left side. × 34.
— 2. Same, dorsal view.
— 3. Anterior part of the body of another specimen, with a somewhat abnormal form of the head, viewed from left side and more highly magnified (antennæ omitted).
— 4. Tail viewed from left side.
— 5. One of its terminal claws, more highly magnified.
— 6. Adult male, viewed from right side. × 63.

Pl. III.

Ceriodaphnia sublævis, G. O. Sars.

Fig. 1. Adult female, ventral view (rami of the antennæ omitted). × 63.
— 2. Same, viewed from left side.
— 3. Fragment of carapace, highly magnified, showing the delicate, reticulated sculpture.
— 4. Frontal part of head, lateral view.
— 5. Terminal part of tail, viewed from left side.
— 6. Adult male, viewed from right side. × 120.

Alona eucostata, G. O. Sars.

Fig. 7. Adult ovigerous female, viewed from left side. × 125.
— 8. Terminal part of tail, more highly magnified, lateral view.
— 9. Adult male, lateral view. × 150.
— 10. Terminal part of tail of same, more highly magnified.

Alona macrocopa, G. O. Sars.

Fig. 11. Adult ovigerous female, viewed from left side. × 150.
— 12. Antenna, more highly magnified.
— 13. Terminal part of tail, lateral view.
— 14. Adult male, viewed from left side. × 150.
— 15. Terminal part of tail of same, more highly magnified.

Pl. IV.

Cypris bennelong, King.

Fig. 1a. Adult female, viewed from right side. × 48.
— 1b. Same, dorsal view.
— 1c. Masticatory part of 1st maxilla, more highly magnified.
— 1d. Caudal ramus.

Cypris sydneia, King.

Fig. 2a. Adult female, viewed from right side. × 50.
— 2b. Same, dorsal view.
— 2c. Caudal ramus.

Cypridopsis minna, (King).

Fig. 3a. Adult female, viewed from left side. × 50.
— 3b. Same, dorsal view.
— 3c. Same, ventral view.
— 3d. Caudal ramus.

Cypridopsis viridis, (Thomson).

Fig. 4a. Adult female, viewed from left side. × 50.
— 4b. Same, dorsal view.
— 4c. Caudal ramus.

Pl. V.

Candonocypris candonoides, (King).

Fig. 1a. Adult female, viewed from left side. × 42.
— 1b. Same, dorsal view.
— 1c. Caudal ramus.

Candonocypris assimilis. G. O. Sars.

Fig. 2a. Adult female, viewed from left side. × 42.
— 2b. Same, dorsal view.
— 2c. Caudal ramus.

Ilyodromus stanleyanus, (King).

Fig. 3a. Adult female, viewed from right side. × 42.
— 3b. Same, dorsal view.
— 3c. Animal lying within the left valve, the right one being removed, more highly magnified.
— 3d. Masticatory part of 1st maxillæ.
— 3e. Caudal ramus.

Pl. VI.

Ilyodromus varrovillius, (King).

Fig. 1a. Adult female, viewed from right side. × 42.
— 1b. Same, dorsal view.
— 1c. Caudal ramus, together with the right genital lobe.

Ilyodromus smaragdinus, G. O. Sars.

Fig. 2a. Adult female, viewed from right side. × 42.
— 2b. Same, dorsal view.
— 2c. Caudal ramus.

Ilyodromus substriatus, G. O. Sars.

Fig. 3a. Adult female, viewed from right side. × 42.
— 3b. Same, dorsal view.
— 3c. Caudal ramus.

Ilyodromus obtusus, G. O. Sars.

Fig. 4a. Adult female, viewed from right side. × 42.
— 4b. Same, dorsal view.
— 4c. Masticatory part of 1st maxillæ.
— 4d. Caudal ramus.

Pl. VII.

Boeckella triarticulata, (Thomson).

Fig. 1. Adult female, dorsal view (outer part of left anterior antenna omitted). × 50.
— 2. Outer part of an antenna, more highly magnified.
— 3. Posterior part of body, dorsal view.
— 4. Adult male, viewed from right side. × 50.
— 5. Right geniculate antenna of 1st pair of same, more highly magnified (basal part of the antenna omitted).
— 6. Last pair of legs of same, viewed from the posterior face.
— 7. Dentated lamella from the left leg, highly magnified.
— 8. Posterior part of body, dorsal view.

Pl. VIII.

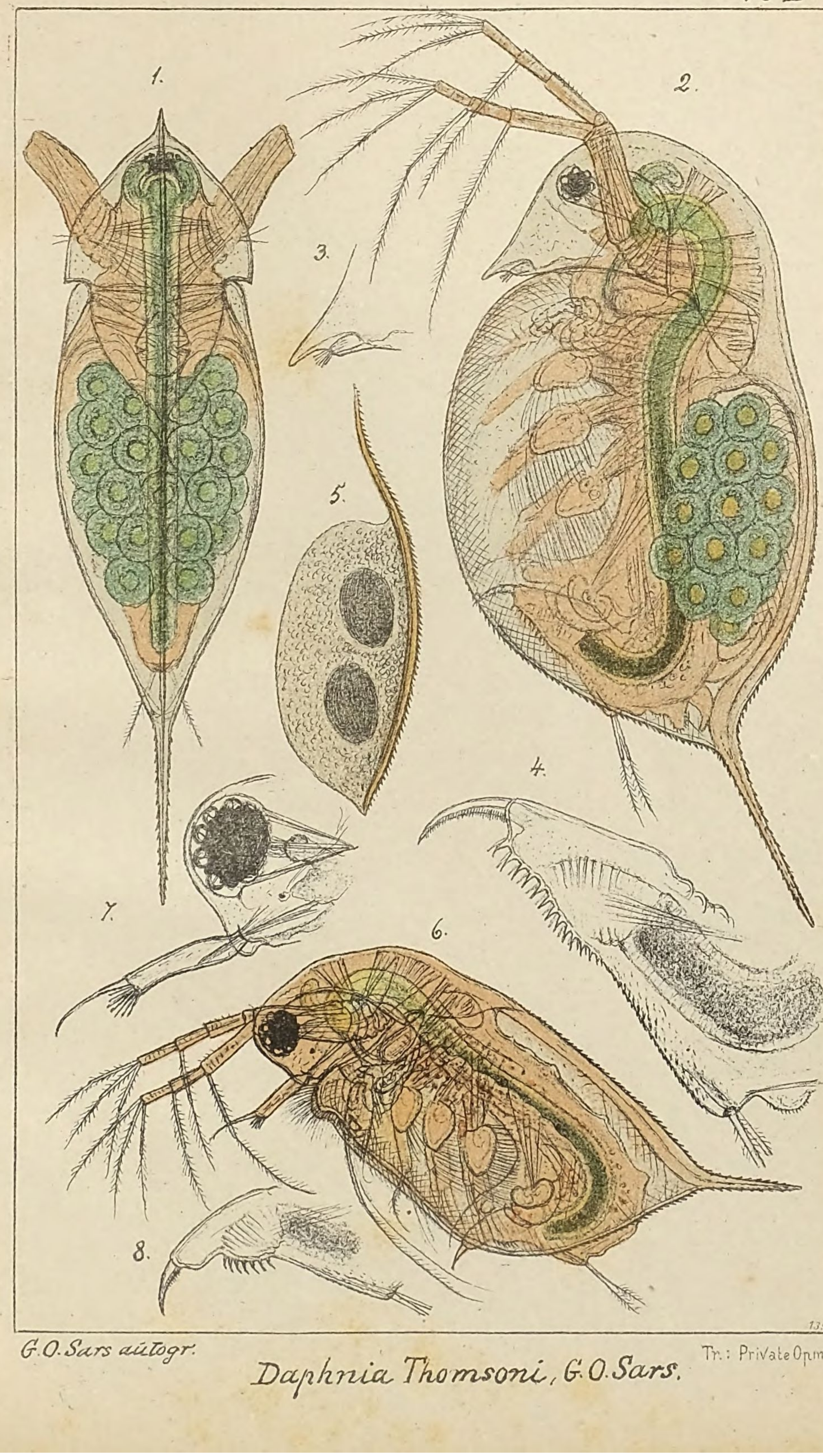
Boeckella triarticulata, (Thomson).

(continued).

Fig. 1. Antenna of 2nd pair of female.
– 2. Mandible with palp.

Fig. 3. Maxilla.
— 4. Anterior maxilliped.
— 5. Posterior maxilliped.
— 6. Leg of 1st pair.
— 7. Leg of 2nd pair.
— 8. Leg of 4th pair.
— 9. Leg of last pair (female).

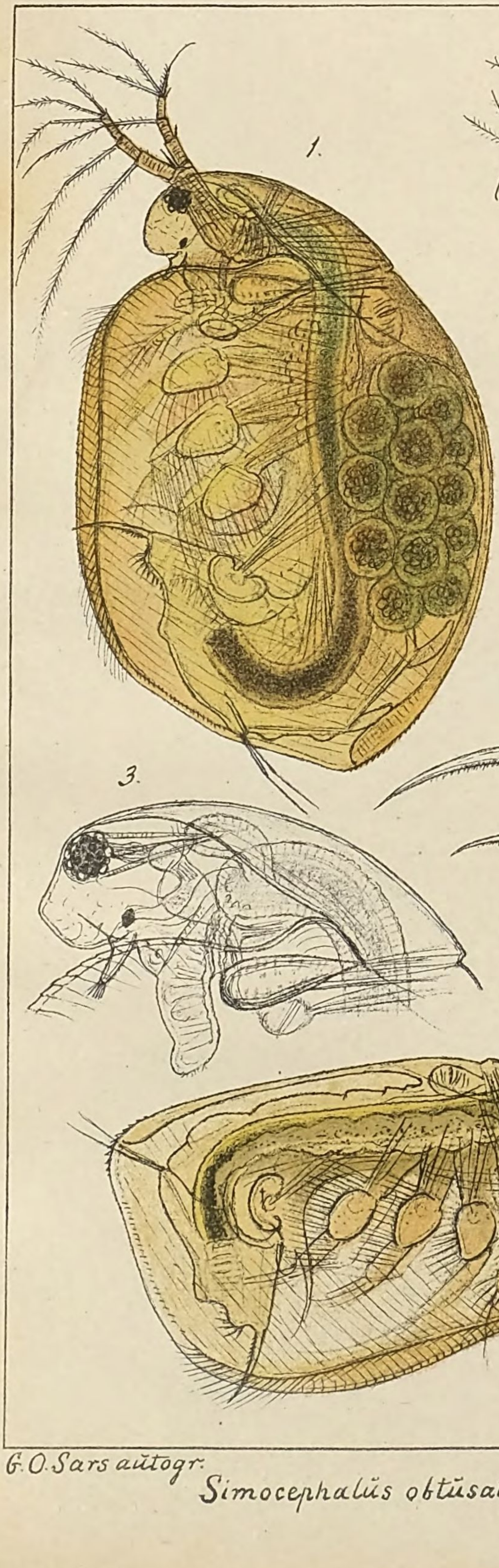
Pl. I.

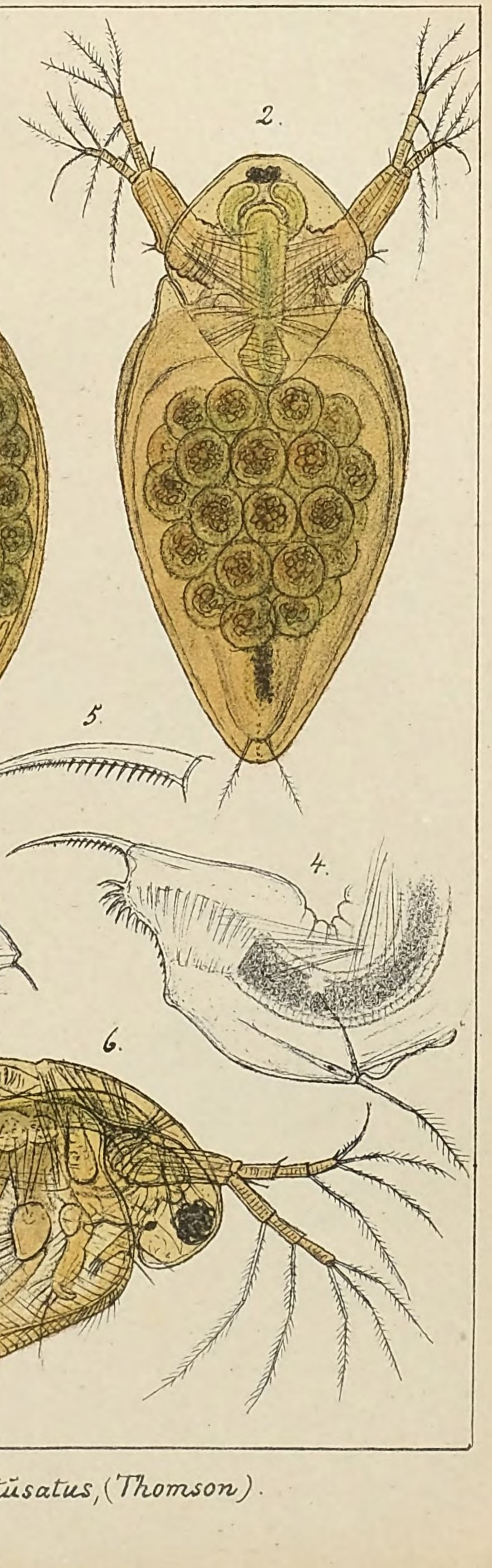


G.O. Sars autogr.

Tr.: Private Opmåling.

Daphnia Thomsoni, G.O. Sars.


1.


2.

5.

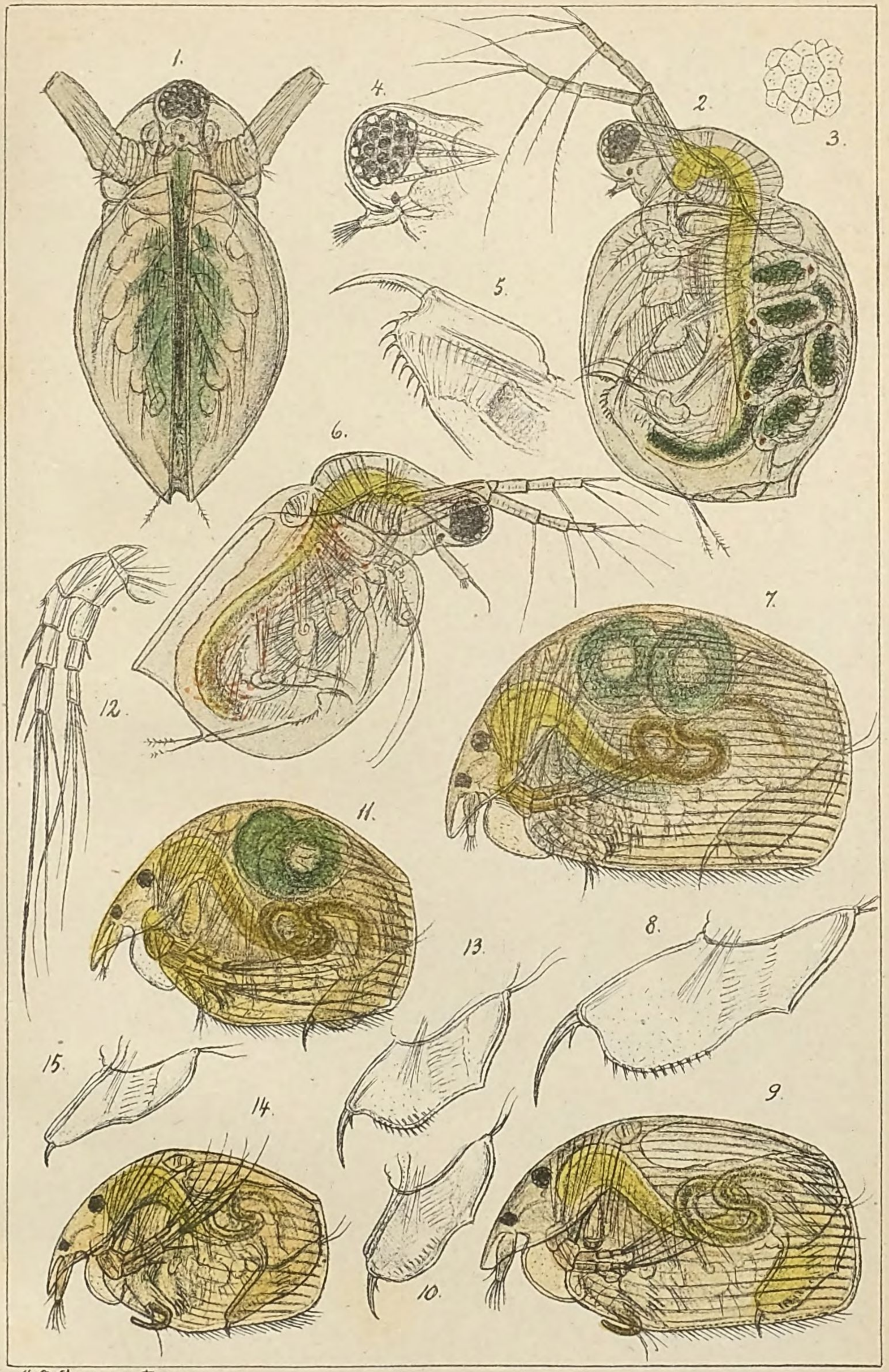
3.

4.

6.

G. O. Sars autogr.

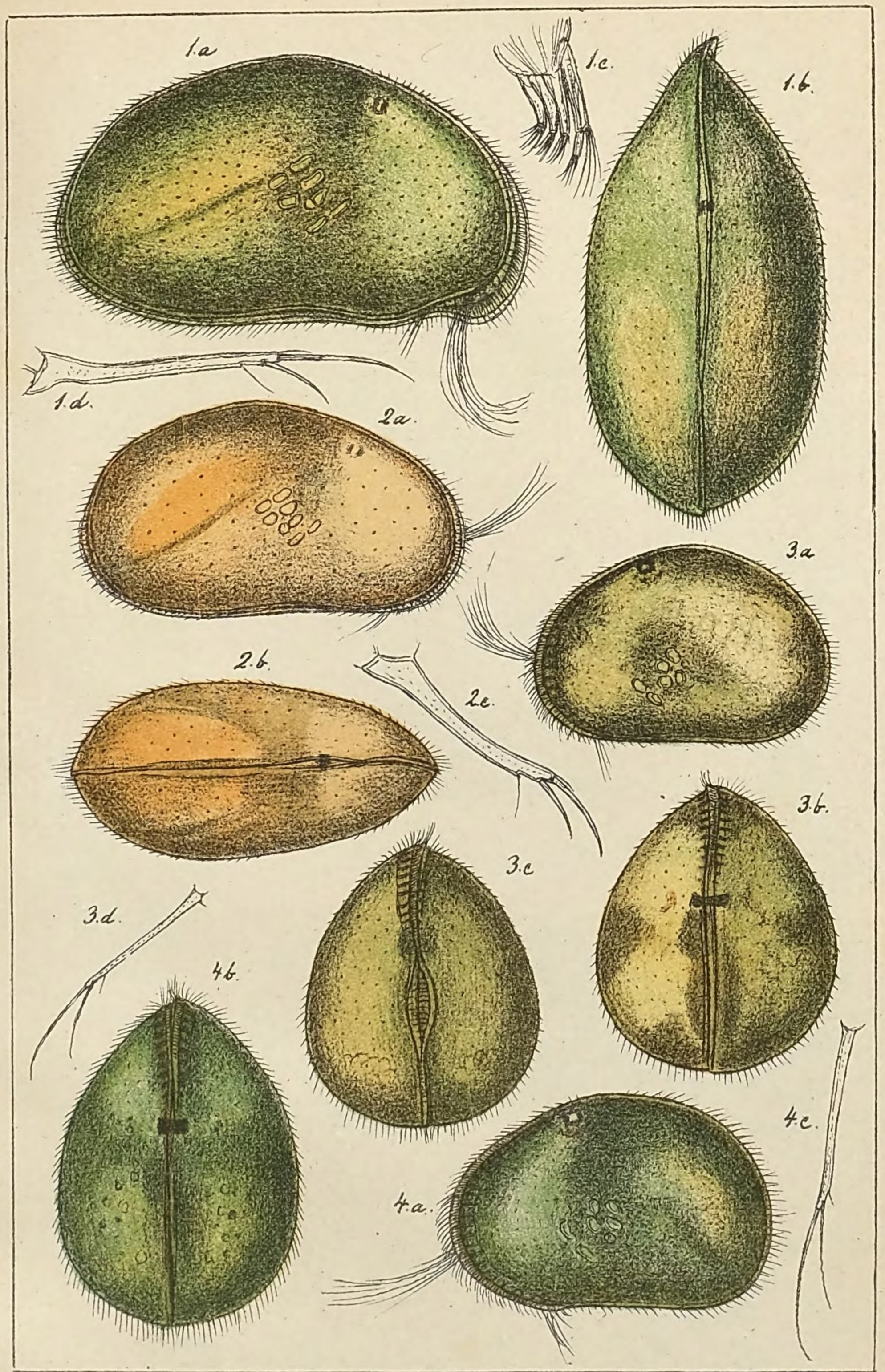
Simocephalus obtusatus, (Thomson).



G.O.Sars autogr.

Fig. 1–6. Ceriodaphnia sübläevis, G.O.Sars. Fig 7-10. Alona ecaudata, G.O.Sars.

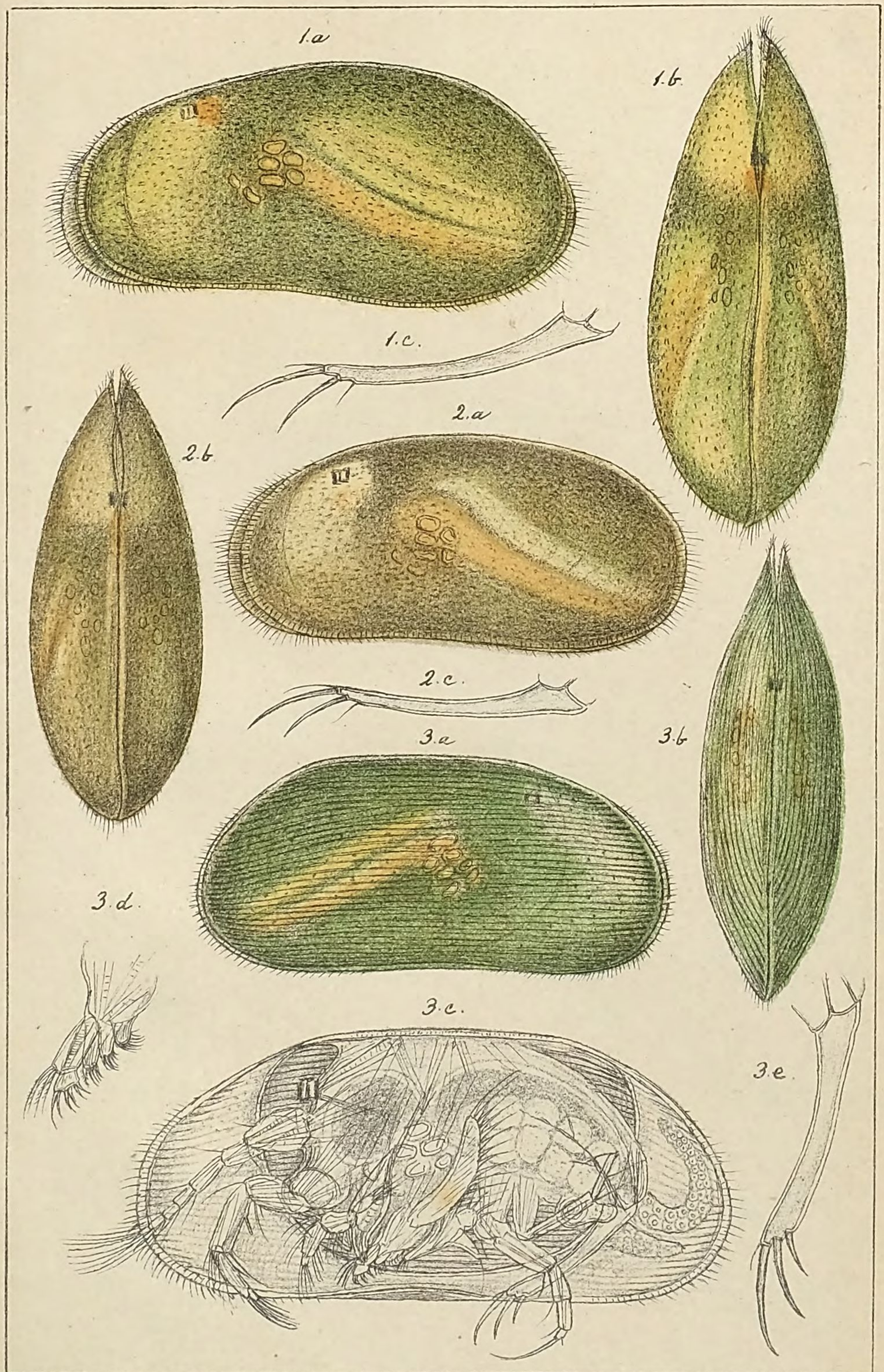
Fig. 11–15. Alona macrocopa, G.O.Sars.



G.O. Sars autogr.

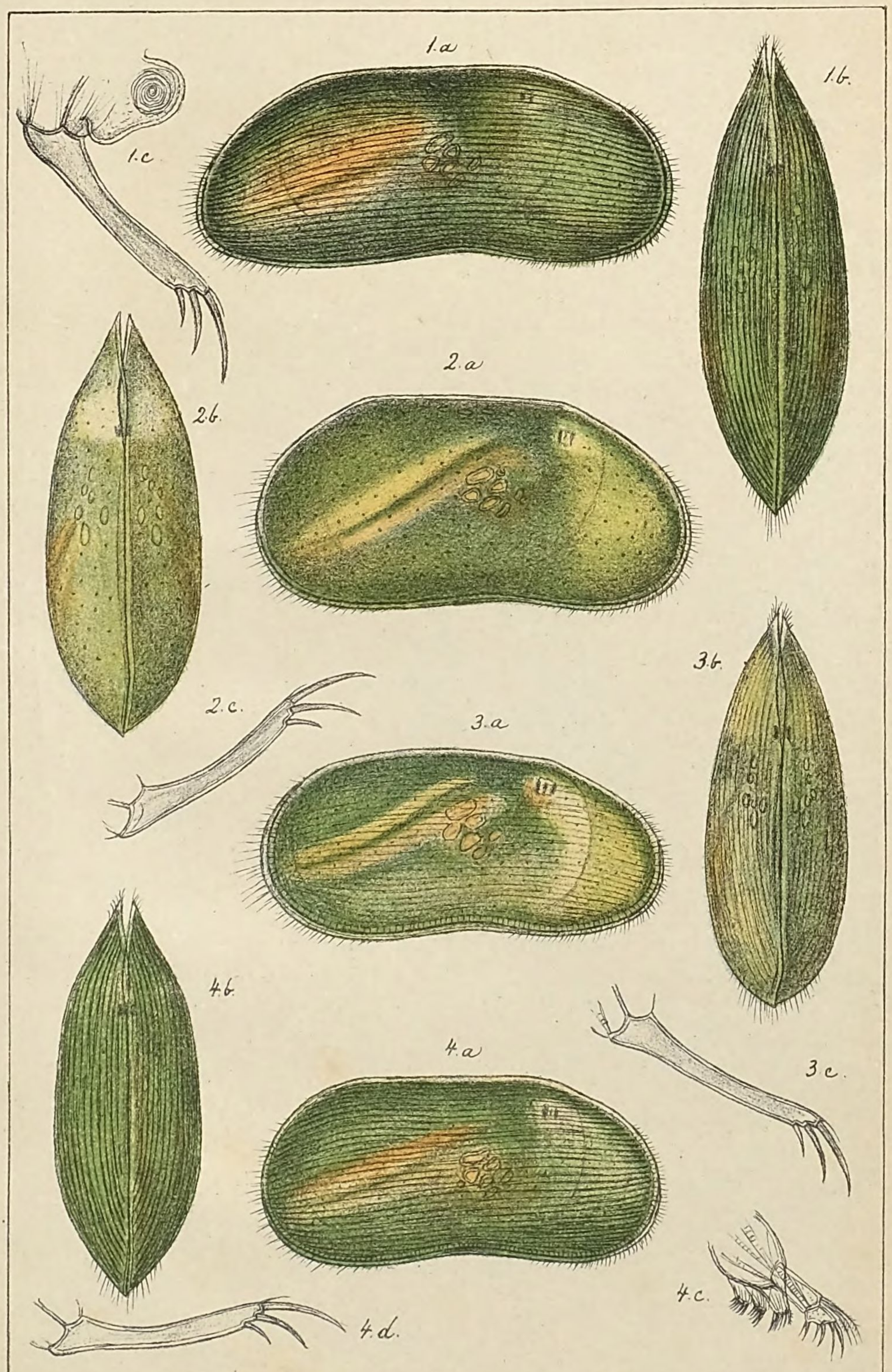
Fig. 1.a-d. Cypris bennelong, King. Fig. 2 a-c. Cypris sydnecia, King.
Fig. 3 a-d. Cypridopsis minna, (King). Fig. 4 a-c Cypridopsis viridis, (Thoms.)

Pl. V.



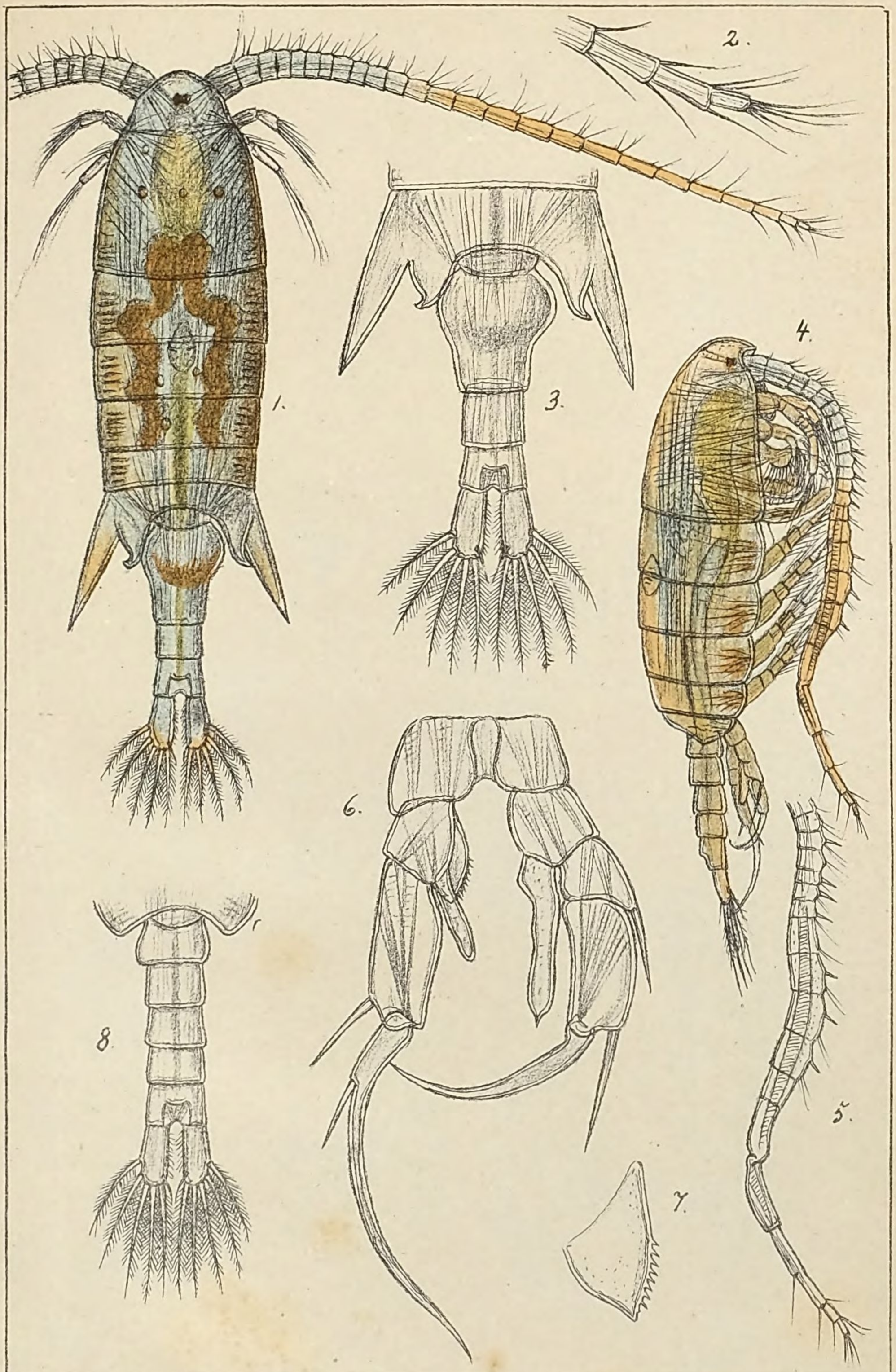
G.O.Sars autogr.

Fig. 1. a-c. Herpetocypris candonoides, (King). Fig. 2a-c. Herpetocypris assimilis, G.O.Sars.
Fig. 3. a-e. Ilyodromus stanleyanus, (King).



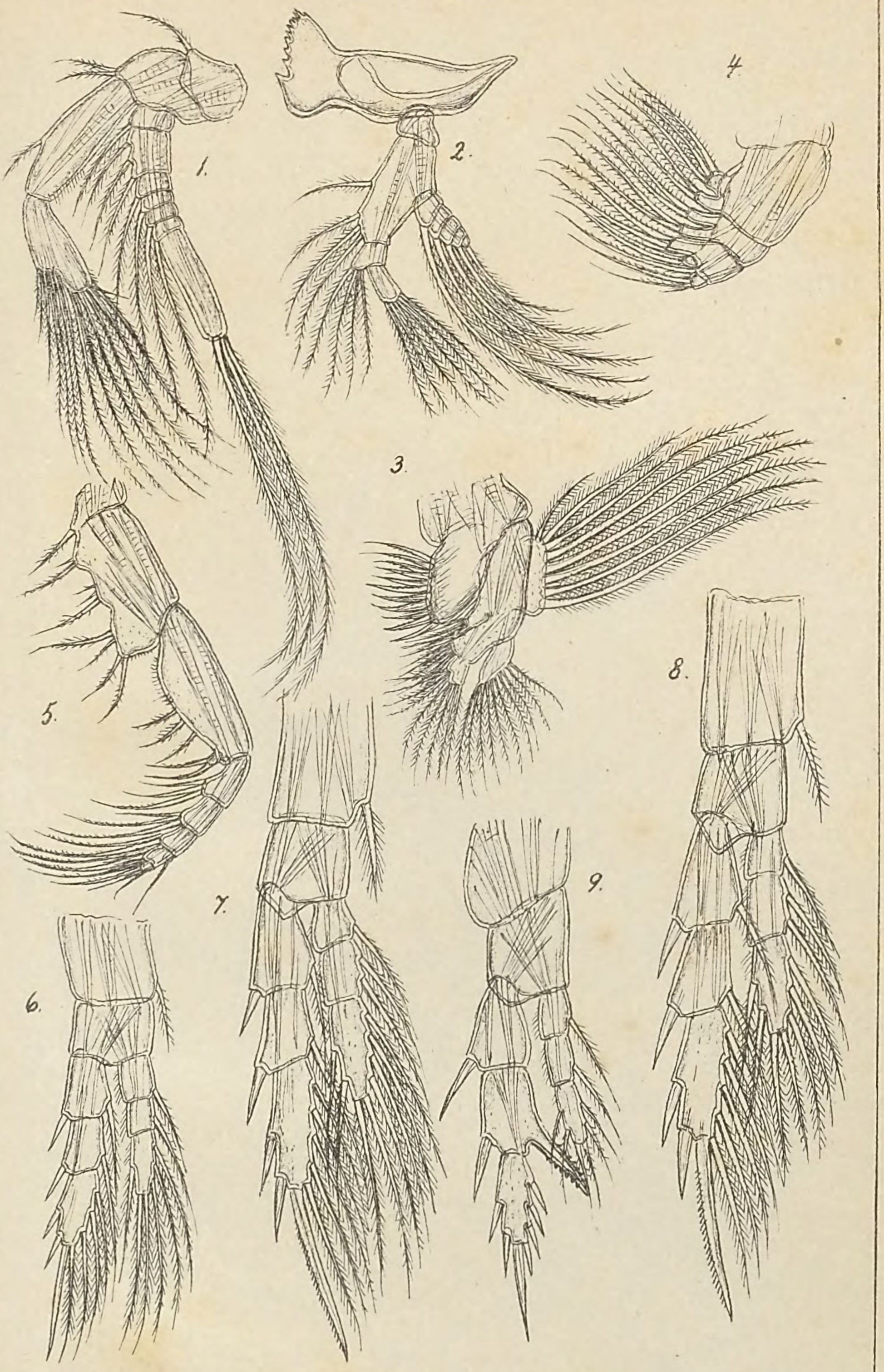
G.O.Sars autogr.

Fig. 1.a-c Ilyodromus varrovillius, (King). Fig. 2.a-c. Ilyodromus smaragdinus G.O.Sars.
Fig. 3.a-c. Ilyodromus substriatus, G.O.Sars. Fig. 4.a-d. Ilyodromus obtusus, G.O.Sars.



G.O. Sars autogr.

Boeckella triarticulata, (Thomson).



G.O. Sars autogr.

Boeckella triarticulata, (Thomson).
(contin.)

Bog

BSB Bayerische StaatsBibliothek

MDZ Münchener DigitalisierungsZentrum Digitale Bibliothek

Sars, G. O.,

Contributions to the Knowledge of the Fresh-water Entomostraca of New Zealand as shown by artificial hatching fr. dried mud

Kristiania 1894

4 Zool. 321 uzd
urn:nbn:de:bvb:12-bsb11532780-0